TECHNICAL REPORT

2012 CRASH STUDY

City of Lincoln

Project No. 702688

June 2014

CITY OF LINCOLN NEBRASKA

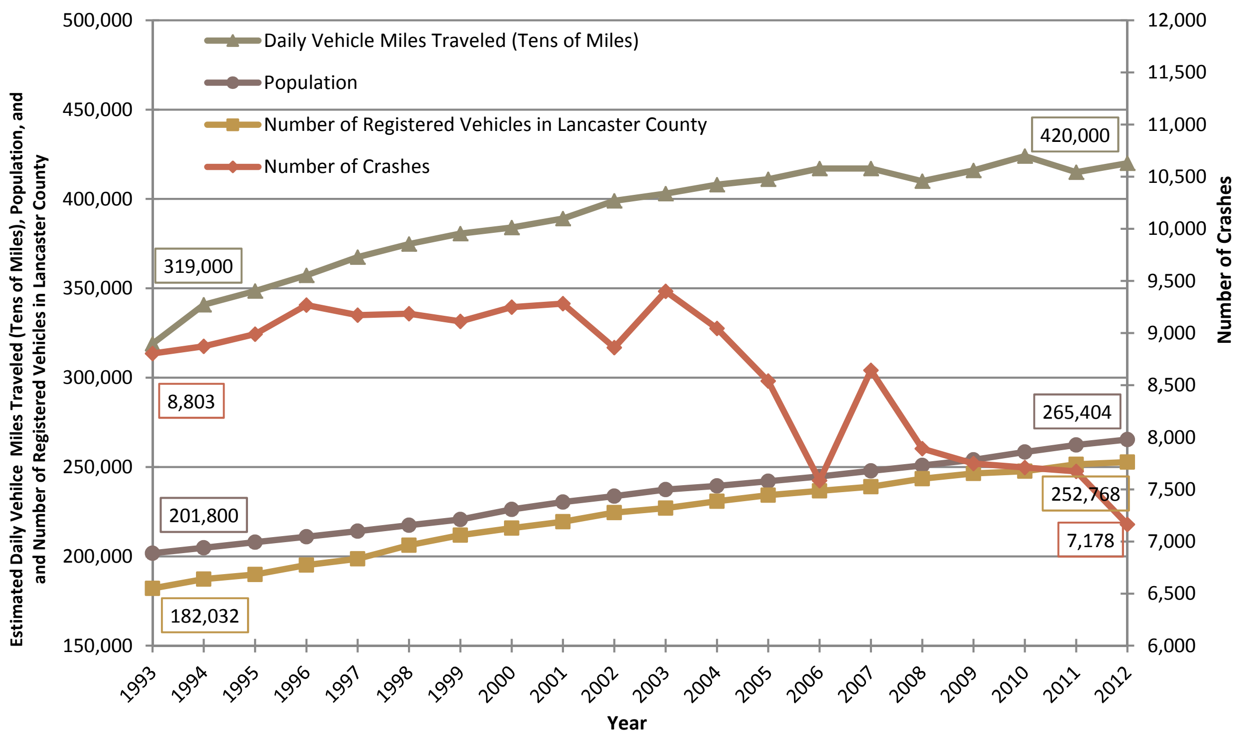
ITERIS

EXECUTIVE SUMMARY

The City of Lincoln conducts a crash study annually to analyze crash data, develop potential countermeasures, and prioritize safety improvements to the City's roadway infrastructure. Effective safety improvements rely on a careful analysis of traffic crash data. The annual crash study provides quantifiable results that are used to assist decision makers in objectively selecting, prioritizing, and applying safety treatments. The following information summarizes results and recommendations from the 2012 Crash Study.

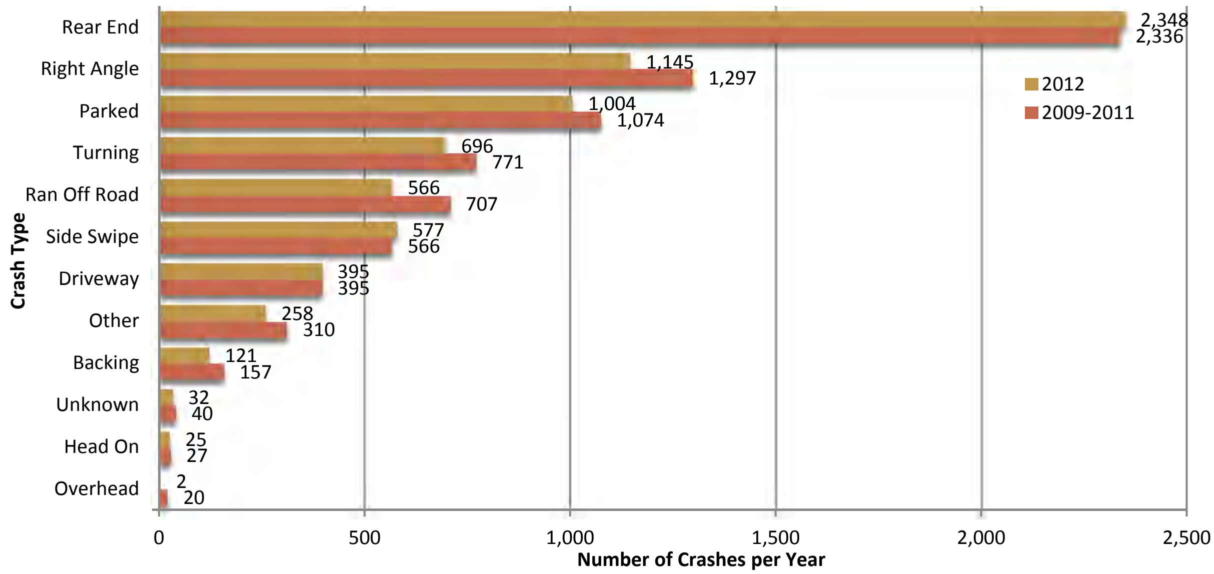
HISTORICAL CRASH TRENDS

Over the 20-year period ending in 2012, the estimated daily vehicle miles traveled and number of registered vehicles (in Lancaster County) increased annually, while the total number of crashes has generally decreased. In general, the total number of crashes at the state and national levels also decreased over this time period.



2012 CRASH DATA

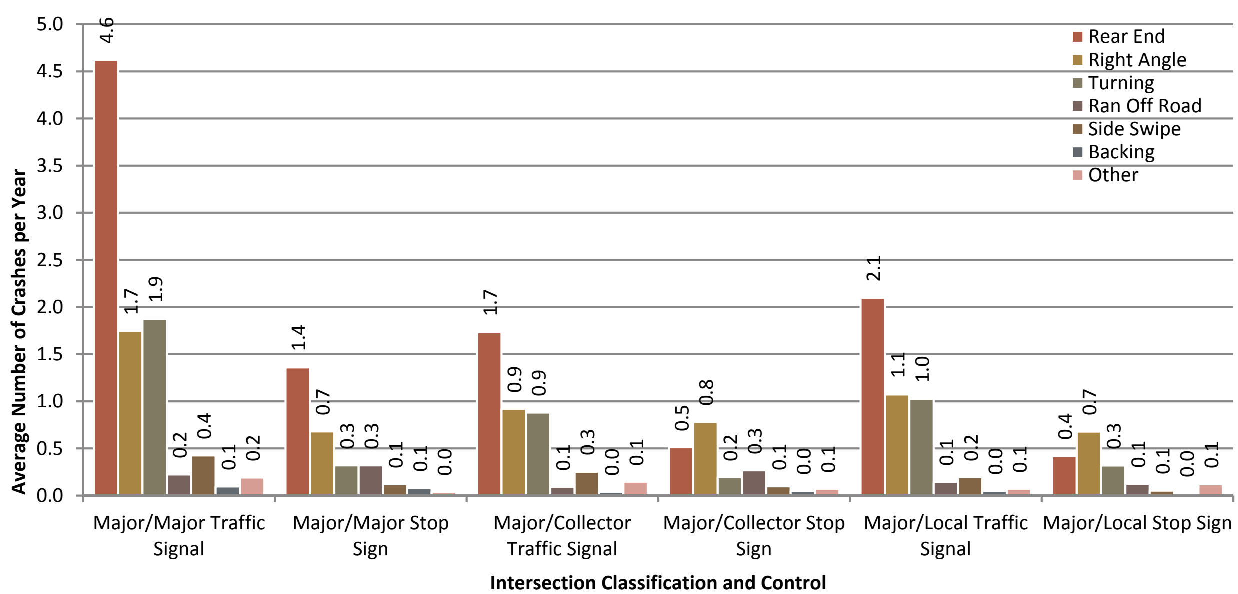
The figure below shows a comparison of the 2012 crash data vs. the previous 3-year average. The graph shows that there were generally fewer crashes of each type during 2012 when compared with the previous 3-year average, with the exception of rear end and some side swipe crashes.



The following table summarizes the total cost for crashes in the City of Lincoln in 2012. These costs include not only capital costs (property damage, etc.), but also quality-of-life costs. In 2012, 7,178 crashes cost society **$277 million** (this does not include over 900 crashes that were reported on private property in Lincoln in 2012).

Crash Type	Cost per Crash	2012 Crashes	Total Costs
Fatal	$5,360,000	11	$59,000,000
Injury	$109,000	1,691	$185,032,000
PDO	$9,650	3,502	$33,807,000
NR	$1,000	1,974	$1,974,000
Total		7,178	$279,813,000

The average number of crashes for each crash type at the most common intersection classifications can be found in the figure below for the year 2012.



CRASH COUNTERMEASURES

In 2012, **75 intersections** were identified as having a high overall crash rate or a specific crash pattern, and 32 intersections were evaluated in greater detail to determine crash patterns and identify potential countermeasures. After analyzing crash trends, **109 countermeasures** were recommended and, if implemented, are expected to improve safety and reduce costs to society. The total cost of all countermeasures, if implemented today, is **$8.5 million**. If all countermeasures were implemented, the overall expected benefit to cost ratio is calculated at **23:1**.

SAFETY EFFECTIVENESS

The City of Lincoln provided a list of 36 intersections where countermeasures had been identified and implemented since 2003. Improvements range from low cost (installations of signs) to high cost (total intersection reconstruction). The crash history of each intersection was evaluated before and after the intersection improvements were identified. The before and after analysis consisted of the total number of crashes at the intersection, the EPDO Crash Rate, benefits to date, projected benefits over the life of the project, and a projected benefit-to-cost. In summary:

- The City of Lincoln has spent **$25.2 million** on these 36 projects.
- To date, the City has been able to secure over **$11 million** in federal funding to support local safety projects.
- To date, the intersection improvements have resulted in societal cost savings of over **$79 million** in comprehensive crash costs.
- If the crash trends continue, the projected net benefits are estimated to be nearly **$243 million** over the service life of these projects.

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1.0 INTRODUCTION

The City of Lincoln conducts a crash study annually to identify safety problems, develop countermeasures, and plan for and prioritize safety improvements to the City's roadway infrastructure. Effective safety improvements rely on a careful analysis of traffic crash data. The crash study utilizes crash data from the Lincoln Police Department Criminal Justice Information System (CJIS) database. The crash data is analyzed at a high level to identify long-term trends in crash numbers, rates, and severity. High-crash intersections are also analyzed to identify crash patterns and development countermeasures that can be implemented to reduce or eliminate the crash problem. The annual crash study provides quantifiable results that are used to assist decision makers in objectively selecting, prioritizing and applying safety treatments. This information will also be useful to those involved in the "four E's" of traffic safety: Engineering, Education, Enforcement, and Emergency Medical Services in reducing the severity and frequency of traffic crashes in the City. Reducing crashes can result in significant cost savings to the City and to the motoring public. The following sections document the procedure used and results of the 2012 Crash Study.

Reducing crashes can result in significant cost savings to the City and to the motoring public.

2.0 HISTORICAL CRASH DATA

The 2012 Lincoln Crash Study has established a 20-year historic timeframe for general comparative purposes of the crash data. The 20-year timeframe is used to illustrate long-term trends within the City of Lincoln related to crashes. As illustrated in most of the following sections and figures, this annual safety program for the City of Lincoln has resulted in positive and improving results.

2.1 NUMBER OF CRASHES VS DAILY MILES TRAVELED, POPULATION, AND REGISTERED VEHICLES

Between 1993 and 2012, the population of the City of Lincoln increased from 201,800 to 265,404, an increase of 32%. Likewise, daily vehicle miles traveled (DVMT) in the City increased from 3.19 million to 4.20 million, an increase of 32%. Finally, the number of registered vehicles in Lancaster County increased from 182,032 to 252,768, an increase of 39%. However, the number of crashes in the City decreased from 8,803 in 1993 to 7,178 in 2012, a decrease of 19%. Similar trends can be seen at the state and national levels.

Over the last 20 years, population increased 32%, vehicle miles traveled increased 32%, registered vehicles increased 39%, but crashes decreased 19%.

Figure 1 graphically illustrates the change in the number of crashes, population, daily vehicle miles traveled, and number of registered vehicles over this 20 year period.

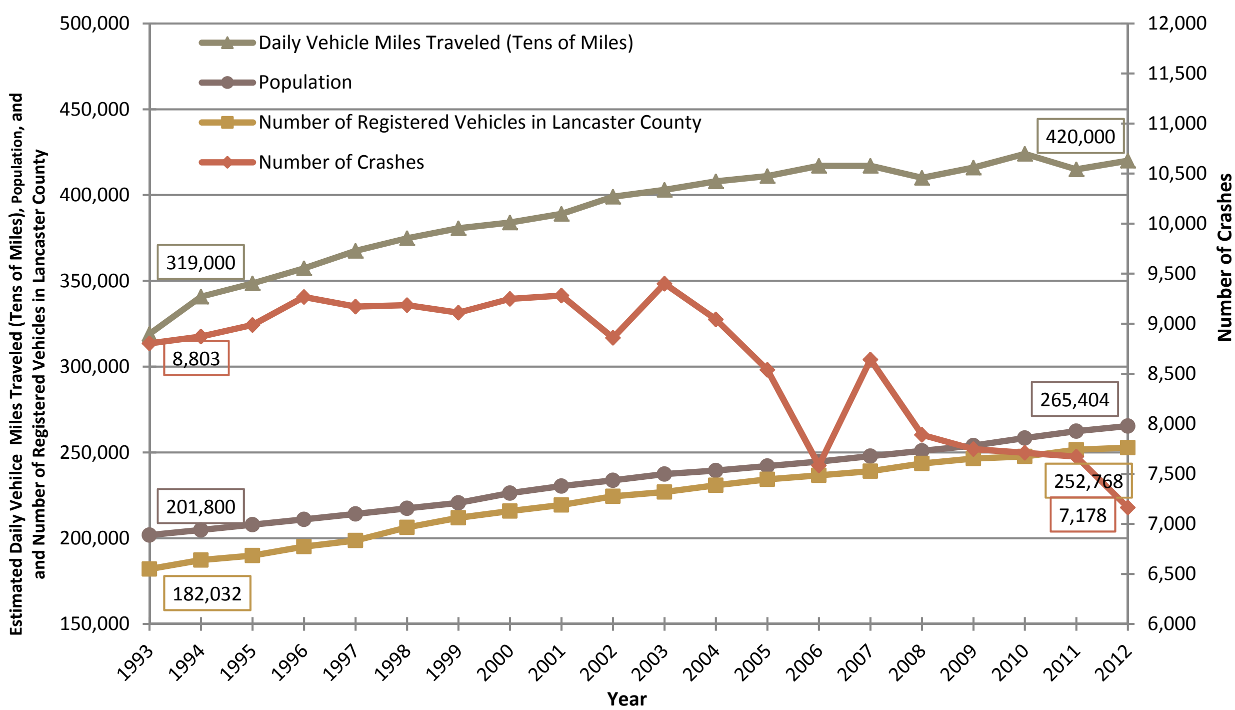


Figure 1 – Number of Crashes vs. Population, VMT, and Registered Vehicles

Note: Daily vehicle miles traveled for Years 2000 – 2011 have been revised, so DVMT and subsequently, crash rates, published in previous crash studies, have been modified.

2.2 CRASH RATE VS DAILY VEHICLE MILES TRAVELED

Over the last 20 years, the overall crash rate in the City of Lincoln has decreased from 7.56 crashes per million VMT to 4.68 crashes per million VMT, a decrease of 38%.

Because baseline conditions (eg, daily vehicle miles traveled) can fluctuate over time due to changes in population, municipal boundaries, economy, etc., a crash rate can be calculated such that the number of crashes over time can be better compared. Crash rate is a function of both the number of crashes and the number of million vehicle miles traveled over a given time period.

Over the last 20 years, the overall crash rate in the City of Lincoln has decreased from 7.56 crashes per million VMT to 4.68 crashes per million VMT, a decrease of 38%. Figure 2 illustrates the change in DVMT and crash rates since 1993.

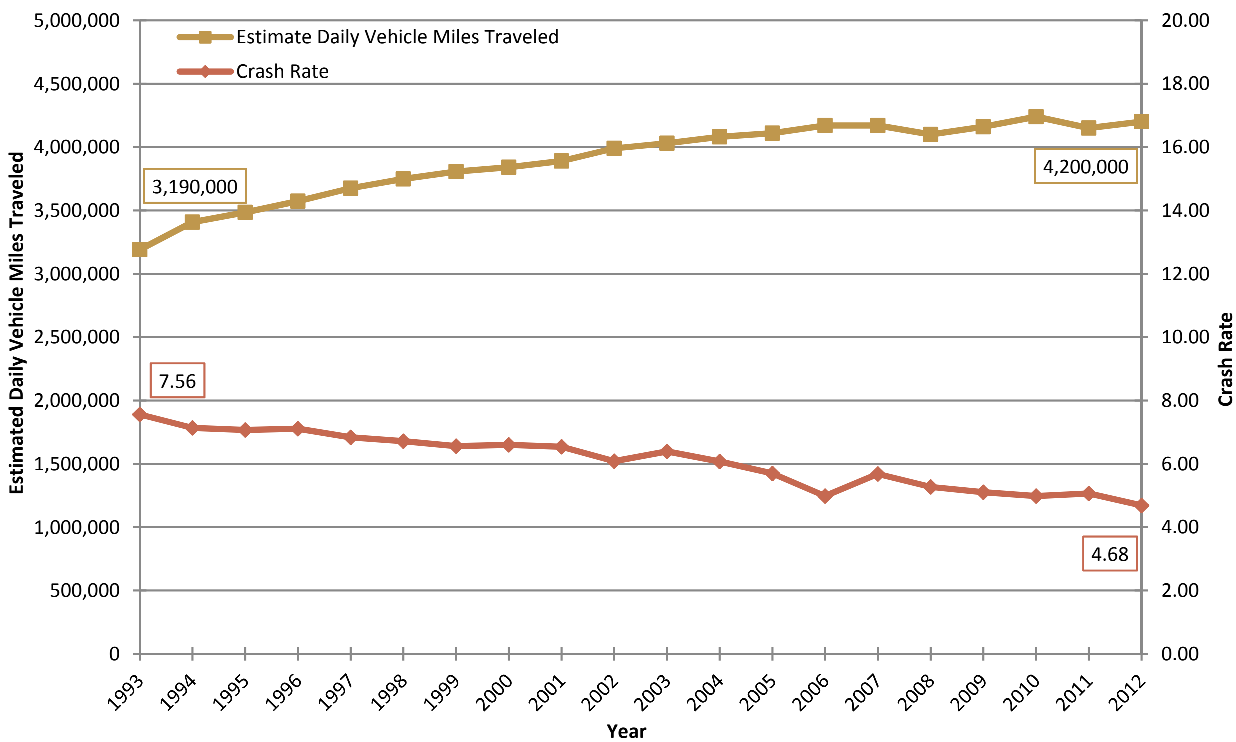


Figure 2 – Crash Rate vs. Daily Miles Traveled

2.3 EXTRAPOLATED HISTORICAL VS ACTUAL CRASHES

In 1993, the number of crashes reported was 8,803. The annual number of crashes steadily rose until about 2003, when 9,400 crashes were reported. Since then, the number of crashes has steadily dropped, with just under 7,200 reported in 2012.

For comparison, if the crash rate from 1993 is coupled with daily VMT from subsequent years, the expected number of crashes can be extrapolated. The extrapolated number of crashes indicates the number of crashes that would have occurred each year if no advances in safety (via engineering, education, or enforcement) were acheived. Utilizing the 1993 crash rate and the daily vehicle miles traveled (DVMT) for 2012, the number of crashes in 2012 would be over 11,500 (or 4,400 more crashes per year). If the 1985 crash rate is used, the number of crashes would be over 16,200 (9,000 more crashes per year). So while even one crash is too many, much advancement in safety has been achieved over the years. These advancements can be attributed to a number of factors including:

- an increase in traffic operations and safety knowledge
- improved design standards
- improved automobile design
- improved access management standards
- intelligent transportation systems (ITS)
- improved safety devices along roadways
- implementation of safety improvements
- traffic enforcement and education

Since 1993, safety advancements have prevented thousands of crashes every year, resulting in nearly 4,400 fewer crashes in 2012.

The resulting extrapolated number of crashes based on the 1985 and 1993 rates, along with the actual number of crashes for each year is illustrated in Figure 3.

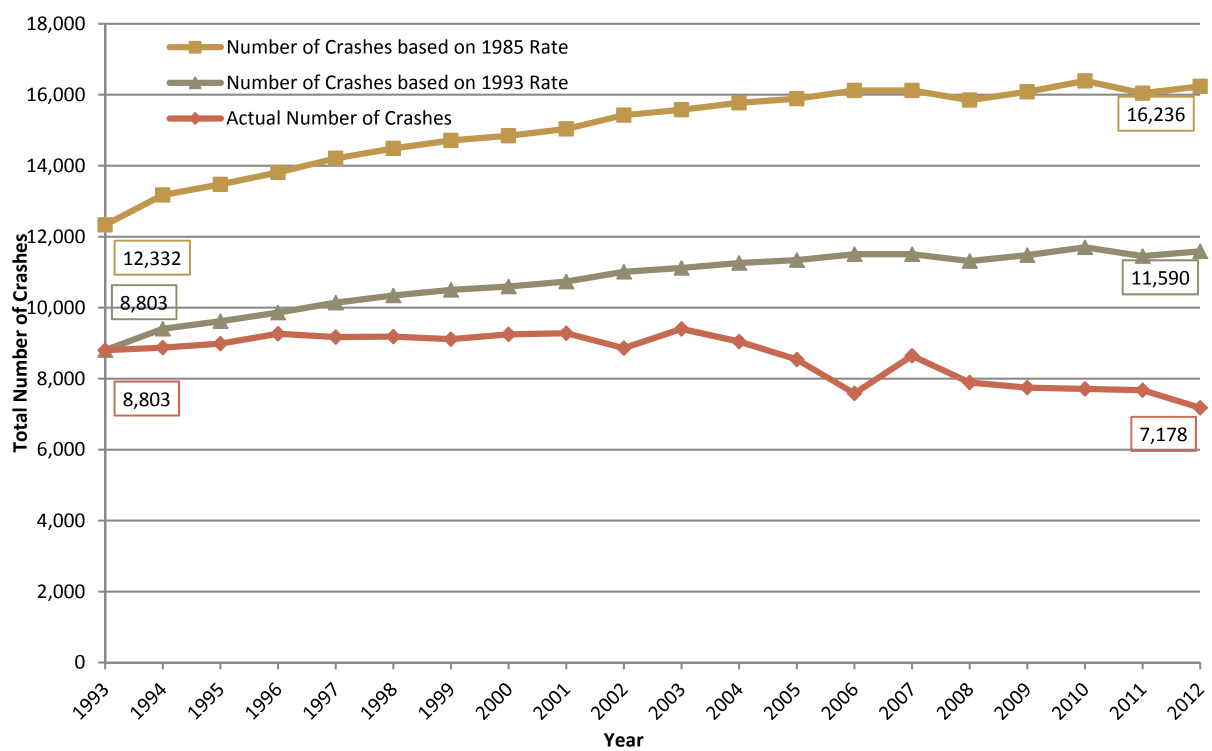


Figure 3 – Extrapolated Historical vs. Actual Crashes

2.4 HISTORICAL CRASHES AND CRASH RATES BY SEVERITY LEVEL

The City of Lincoln categorizes crash rates by several severity levels, including fatal/injury (F+I), property damage only (PDO), and non-reportable (NR). The City began distinguishing between property damage and non-reportable crashes in 1989. Between 1993 and 2012 the number of crashes for each severity level has typically followed the same trend as the overall number of crashes. Figure 4 illustrates the number of crashes for each severity level. As the graph indicates, the number of crashes has been steadily decreasing, particularly for the last 10 years. One exception may be the number of non-reportable crashes, which is based on a minimum property damage value set by state law (currently $1,000). Crash rates for all crashes and crash severities have also steadily decreased.

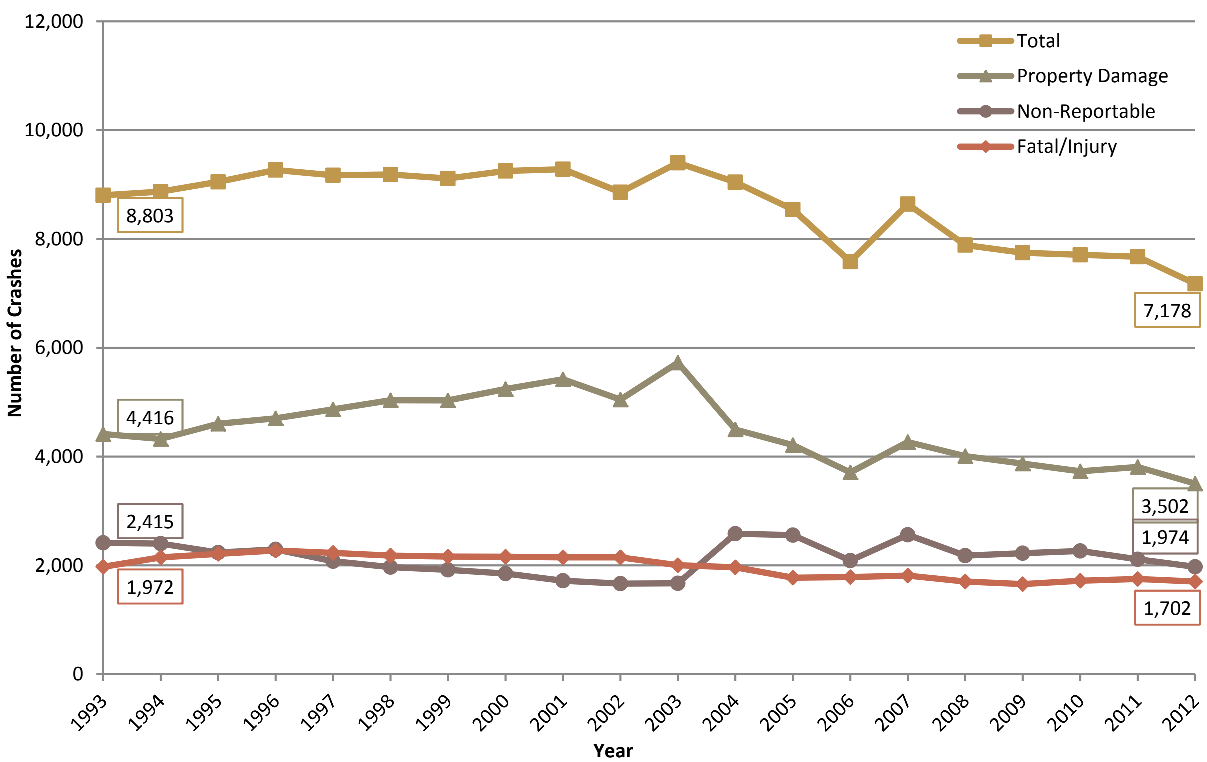


Figure 4 – Historical Number of Crashes by Severity Level

2.5 PEDESTRIAN AND BICYCLE CRASHES

Crashes involving pedestrians and bicycles were graphed for the previous two decades to illustrate any general trends in the data, as seen in Figure 5. Because pedestrian and bicycle crashes are rare events, the number of crashes can fluctuate from year to year. In addition, crash rates for pedestrians and bicycles are difficult to calculate because vehicle miles traveled data (or some other measurement of exposure) for these modes are difficult to obtain.

In 2012, there were 169 bicycle crashes reported. In terms of bicycle crashes, there were more crashes in 2012 than in any year since 1996, when 200 crashes occurred. In addition, bicycle crashes have increased in each of the last three years.

Eighty-six (86) pedestrian crashes were reported in 2012. This is the second year of increasing pedestrian crashes, and the highest number of crashes since 2008, when 90 crashes occurred. However, over the last 20 years, pedestrian crashes have steadily declined.

The recent increase in pedestrian and bicycle crashes can likely be attributed to a variety of factors, including but not limited to: general increases in active transportation, weather, and addition of bike lanes, all of which results in more exposure of bicyclists and pedestrians to vehicular traffic.

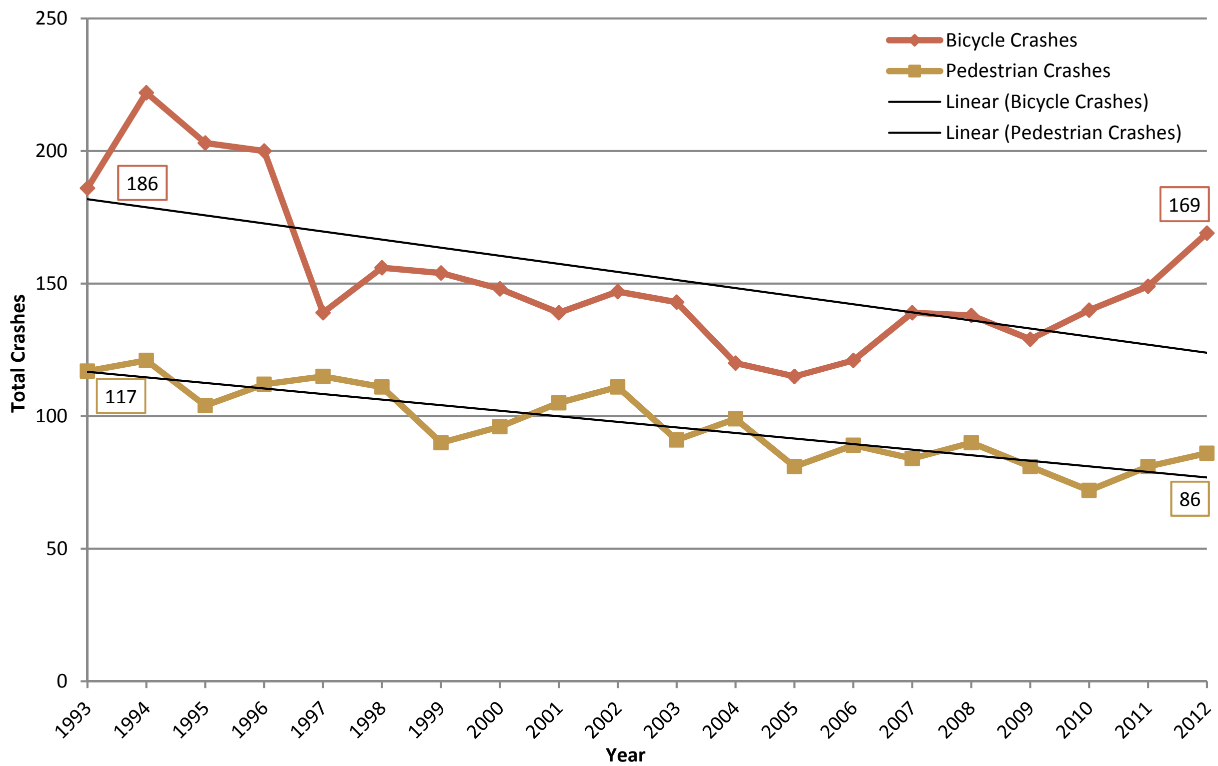


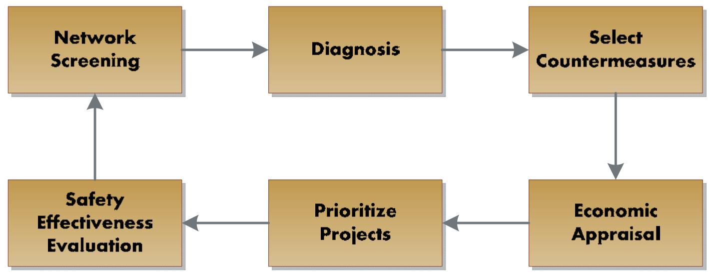
Figure 5 – Historical Pedestrian and Bicycle Crashes

This recent increase in bicycle and pedestrian crashes can likely be attributed to a variety of factors, including but not limited to: general increases in bicycling and active transportation, recent mild weather, and addition of bike lanes, all of which result in more exposure of bicyclists to vehicular traffic. In response, the City should continue to monitor the locations and frequencies of these crashes. Mitigation efforts could include improved facilities, public education, and additional enforcement. In 2014, the City will begin monitoring bicycle volumes around the City.

3.0 STUDY PROCESS

The 2012 Lincoln Crash Study follows general methodologies established in the Highway Safety Manual (HSM). The HSM establishes the Roadway Safety Management Process, which is a repeatable method for conducting safety analyses that is defined in a six-step roadway safety management process. The six step process as outlined in the HSM includes the following steps:

1. Network Screening
2. Diagnosis
3. Select Countermeasure
4. Economic Appraisal
5. Prioritize Projects
6. Safety Effectiveness Evaluation



The process begins with Network Screening, which establishes the focus of the safety analysis. The screening measures used in the analysis are also determined and may include average crash frequency, crash rate, Equivalent Property Damage Only (EPDO), Relative Severity Index, and others. The crash studies the City of Lincoln have been conducting focus on the safety analysis of intersections and use EPDO as an initial primary screening measure. When the network screening task is complete, crash data is evaluated based on the established parameters. Results are then ranked and the intersections with the highest EPDO are deemed most likely to benefit from the implementation of identified countermeasures.

Once the intersections are ranked, a detailed review of the crash data is conducted to diagnose crash patterns at the intersection. The Diagnosis step identifies crash patterns, so appropriate countermeasures can be identified. The identification of crash patterns begins with a review of the crash data which may contain information about crash type, crash severity, road conditions, and time-of-day, among other information. The HSM suggests using three to five years of data to conduct this analysis to improve the reliability of the analysis, as data over short periods of time may fluctuate. During this process, crash diagrams are constructed. After the review of the data and construction of crash diagrams, a field review is conducted to identify characteristics at the intersection that may be contributing to the crash patterns.

With the data reviewed and a site review conducted, countermeasures can be determined. Countermeasures are selected to address the contributing factors for the crash patterns identified during the Diagnosis step. Typically countermeasures are most effective addressing a single contributing factor. Intersections may require multiple countermeasures to address the safety issues at the intersection depending on the contributing factors of the crash patterns identified.

The 2012 Lincoln Crash Study follows general methodologies established in the Highway Safety Manual (HSM). The HSM establishes the Roadway Safety Management Process, which is a repeatable method for conducting safety analyses that is defined in a six-step roadway safety management process.

After the countermeasures have been selected, an Economic Appraisal of the countermeasures is conducted. The Economic Appraisal compares the cost of implementing the countermeasure to its expected benefit. The greater the benefit is compared to the cost, the higher the potential benefit-to-cost (B/C ratio) of an improvement may be. With the B/C ratio calculated for each countermeasure, projects are able to be prioritized, or at least better compared to one another, which is Step 5 in the roadway safety management process. Regardless of a calculated B/C ratio, engineering judgment and analysis of which countermeasures are the "best value" require careful consideration. Each individual intersection and relevant safety enhancements are specific in nature. Balancing the expected improvement potential of standard crash reduction factors with traffic engineering expertise and field experience is desired.

The final step in the roadway safety management process is to conduct a Safety Effectiveness Evaluation. A Safety Effectiveness Evaluation is conducted at intersections where improvements were previously implemented. The analysis focused on the reduction in Crash Rate and EPDO Rate. Based on the changes in the rates, a Benefit-Cost ratio was calculated for each countermeasure reviewed.

4.0 2012 CRASH DATA

In 2012, there were 7,178 crashes on public streets or alleys in the City of Lincoln (crashes on private property are excluded). The 2012 Crash Study primarily focuses on mitigating crashes that occur at intersections. Of the 7,178 total crashes, 3,591 crashes, or 50.1%, occurred at an intersection. The remaining crashes occurred on street segments between intersections or in alleys.

Crashes that occurred at intersections were further analyzed by its functional classification and traffic control. A street segment is classified as a major, collector, or local roadway. Therefore, an intersection can be classified into one of the following groups:

- Major/Major
- Major/Collector
- Major/Local
- Collector/Collector
- Collector/Local
- Local/Local

An intersection will also be controlled by one of the following traffic control devices:

- Traffic signal control
- Stop control (either two-way or all-way)
- Yield control
- No control
- Roundabout control

Table 1 provides a breakdown of average intersection crash rates by the functional classification of the two roadways and the type of traffic control at the intersection. For intersections, crash rates are calculated using total entering volume in place of vehicle miles traveled (VMT). TEV is determined by either average daily traffic (ADT) volumes collected nearby on the intersecting roadways, or by turning movement counts (TMC). Only intersections that experienced at least one crash are included in the rate calculations. Of the 6,199 total intersections in the City, 1,138 intersections experienced at least one crash. While the average number of crashes and crash rates for the Major/Major Roundabout category appear to be high, the vast majority of these crashes occurred at a single intersection, North 14th Street and Superior Street, while it was being converted from a traffic signal to a multi-lane roundabout. Because this roundabout was completed in August 2012, only four months of crash data were available for this study. However, a separate study is being conducted at this intersection to evaluate and potentially mitigate the number of crashes that have occurred at this intersection since its opening.

Table 1 – Average Crash and Equivalent Property Damage Only (EPDO) Rates by Intersection Classification and Control

Functional Classification	Traffic Control	Number Evaluated	Average No. of Crashes	Average Crash Rate	Average EPDO Rate	Rank Method
Major/Major	Traffic Signal	188	9.2	0.77	5.39	EPDO
Major/Major	Stop Sign	25	3.0	0.62	4.68	EPDO
Major/Major	Yield Sign	5	4.2	0.43	1.64	EPDO
Major/Major	Roundabout	3	23.3	1.81	7.13	EPDO
Major/Collector	Traffic Signal*	116	4.3	0.49	3.92	EPDO
Major/Collector	Stop Sign	41	2.0	0.38	2.07	EPDO
Major/Local	Stop Sign	378	1.7	0.33	2.65	Crash
Major/Local	Yield Sign	1	1.0	0.25	0.25	Crash
Collector/Collector	Traffic Signal	5	1.6	0.29	2.62	EPDO
Collector/Collector	Stop Sign	7	1.4	0.71	8.19	Crash
Collector/Local	Stop Sign	41	1.4	0.98	6.58	Crash
Collector/Local	Yield Sign	10	1.3	0.87	7.41	Crash
Collector/Local	No Control	24	1.1	1.32	13.41	Crash
Local/Local	Stop Sign	21	1.2	1.53	13.56	Crash
Local/Local	Yield Sign	24	1.5	1.88	8.73	Crash
Local/Local	No Control	242	1.2	1.75	11.39	Crash

**Major/Local Traffic Signals are included in this dataset.*

While it appears that the intersections of two lower classified roadways have higher crash and EPDO rates, only intersections that experienced at least one crash in 2012 are included in this analysis. In general, the proportion of intersections that experience at least one crash in a year is less for local roads than for major roads. Figure 6 graphically illustrates the EPDO rates for all classifications and control types.

Figure 6 – Average EPDO Rates by Intersection Classification and Control

Figure 7 through Figure 12 illustrate the proportion of crashes by various parameters, including functional classification, traffic control, driver condition, roadway condition, weather condition, and lighting condition.

Figure 7 indicates that, in 2012, the majority of crashes, 53%, occurred at the intersection of two major roadways, followed by 24% at major/local intersections, 11% at major/collector intersections and 10% at local/local intersections.

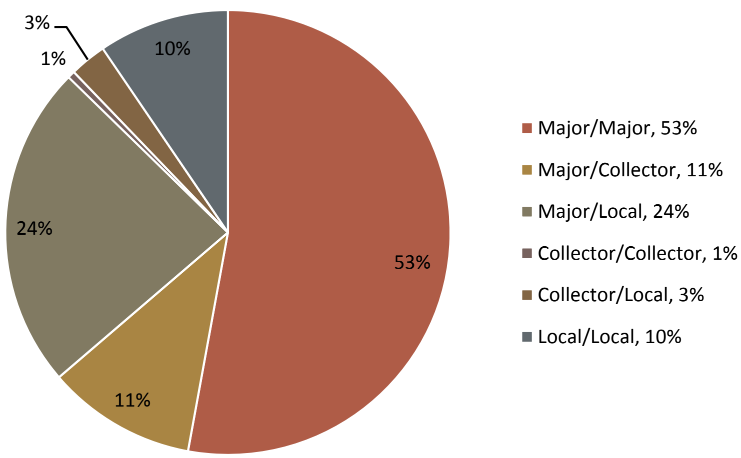


Figure 7 – Proportion of Crashes By Functional Classification

According to Figure 8, 62% of all crashes occurred at intersections controlled by traffic signals, while 25% occurred at stop-controlled intersections and 9% at uncontrolled intersections.

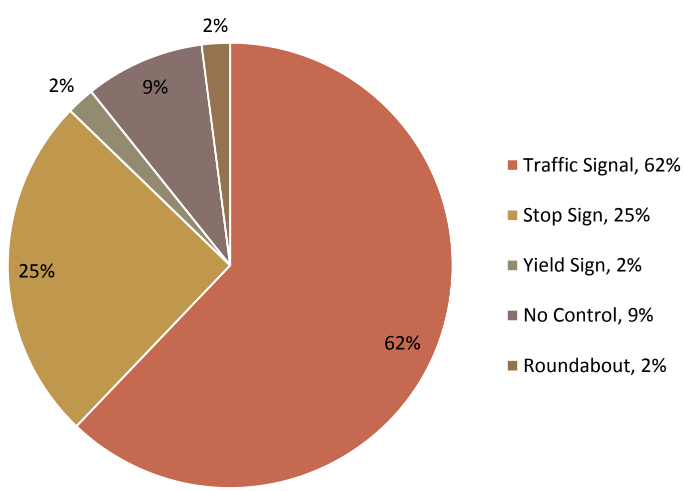


Figure 8 – Proportion of Crashes by Traffic Control

Figure 9 indicates that 62% of drivers were operating their vehicle under "normal" conditions. However, for a large proportion (33%), driver condition is unknown. In some of these cases, however, it is likely drivers were distracted, either by mobile phones, other occupants, or other activities (eating, etc.). Because police cannot observe this distraction after the crash has occurred, it is likely frequently undocumented.

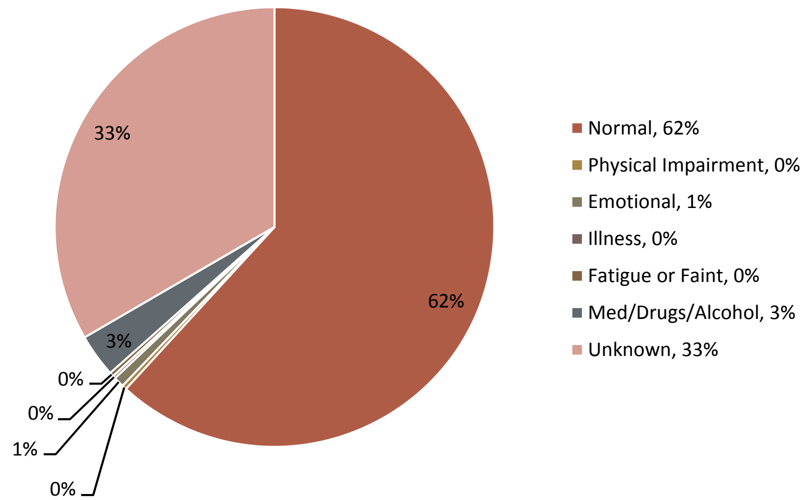


Figure 9 – Proportion of Crashes by Driver Condition

In most crashes, nearly 84%, the condition of the roadway is dry. 9% of all crashes occurred on wet pavement, while 7% occurred on snowy or icy conditions. Figure 10 graphically summarizes all roadway conditions.

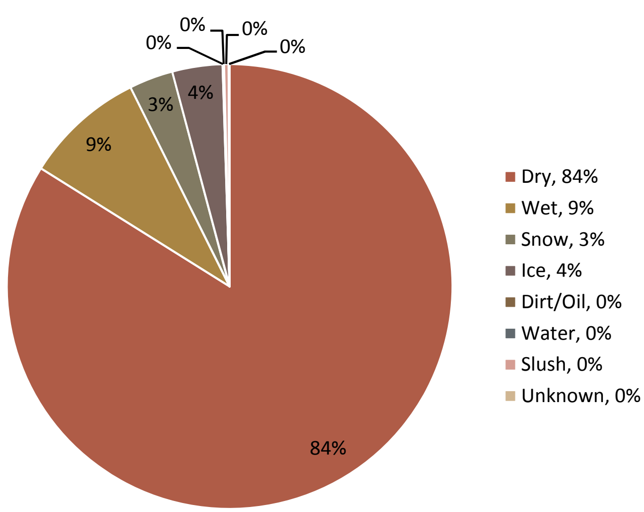


Figure 10 – Proportion of Crashes by Roadway Condition

Like roadway conditions, most crashes occurred under clear (no adverse) weather conditions, with 75% occurring under clear conditions and 18% occurring under cloudy (overcast) conditions. Approximately 4% occurred in rainy conditions and 2% in the snow.

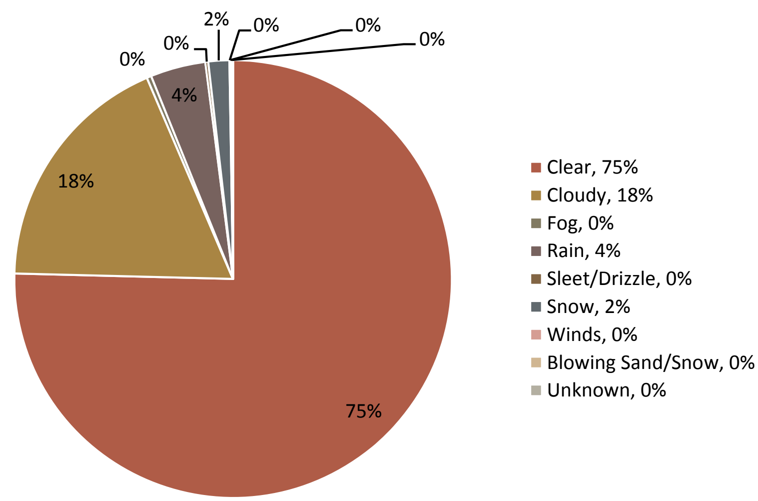


Figure 11 – Proportion of Crashes by Weather Condition

According to Figure 12, the majority of crashes, 76%, occurred during the day between sunrise and sunset. A small percentage occurred at dawn or dusk, while 18% occurred after dark but on lighted roadways.

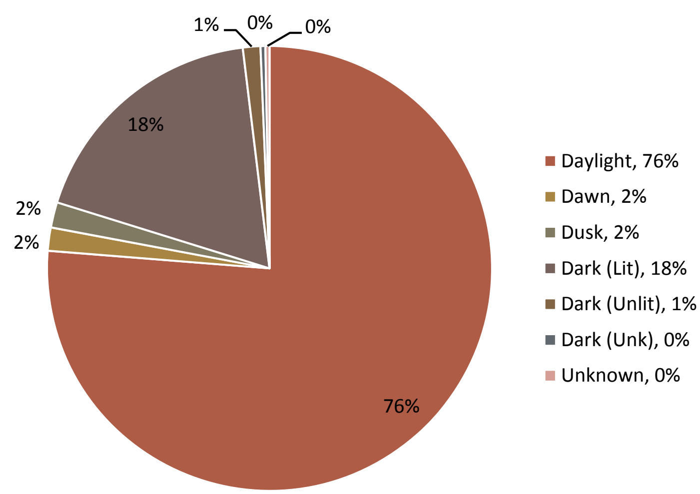


Figure 12 – Proportion of Crashes by Lighting Condition

Figure 13 through Figure 18 illustrate proportions of crash types for intersections controlled by traffic signals or stop signs. In general, the proportions of crashes remained relatively the same compared to 2011.

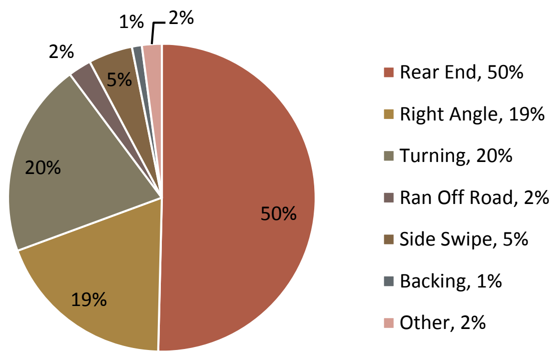


Figure 13 – Proportion of Crash Types at Major/Major Signal-Controlled Intersections

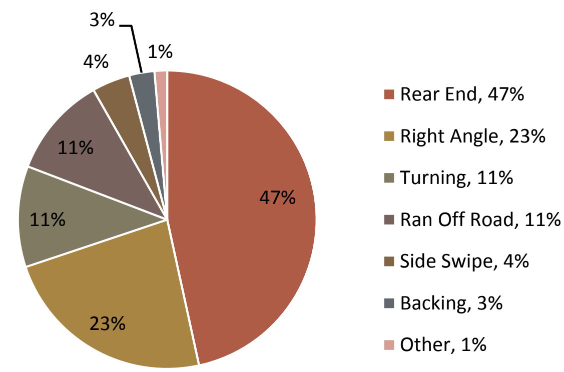


Figure 16 – Proportion of Crash Types at Major/Major Stop-Controlled Intersections

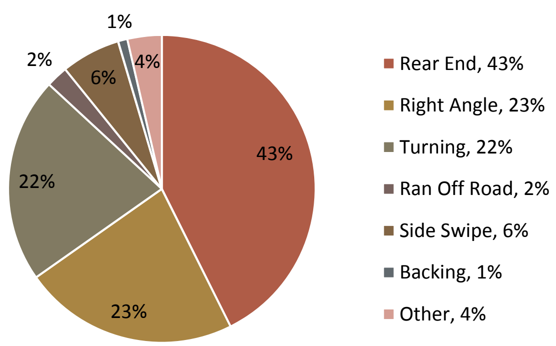


Figure 14 – Proportion of Crash Types at Major/Collector Signal-Controlled Intersections

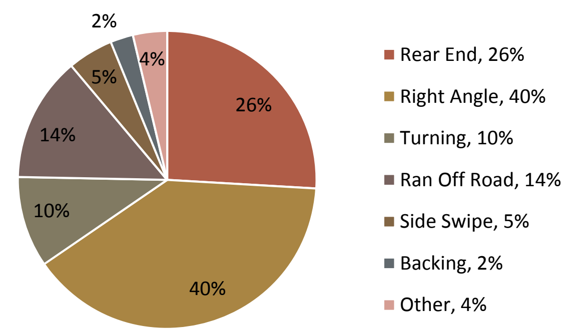


Figure 17 – Proportion of Crash Types at Major/Collector Stop-Controlled Intersections

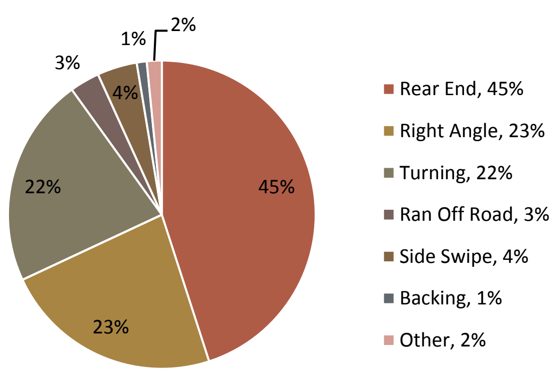


Figure 15 – Proportion of Crash Types at Major/Local Signal-Controlled Intersections

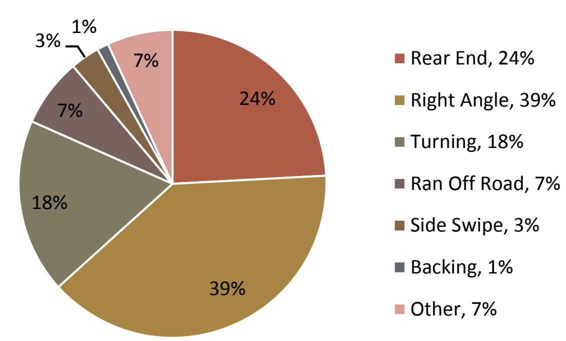


Figure 18 – Proportion of Crash Types at Major/Local Stop-Controlled Intersections

Comparing signal control to stop control at major/major intersections (Figure 13 and Figure 16), signal controlled intersections generally experience a higher proportion of turning crashes, while stop controlled intersections experience a higher proportion of ran-off-road crashes.

At major/collector intersections, the proportion of rear-end crashes is greater at traffic signals than stop-controlled intersections (43% vs 26%), while the proportion of right angle crashes is greater at stop-controlled intersections (40% vs 23%). Like major/major intersections, traffic signals experience a higher proportion of turning crashes but a lower proportion of ran-off-road crashes. Similar trends are seen at major/local intersections.

Figure 19 breaks down average number of crashes for each crash type at selected combinations of classification and control types.

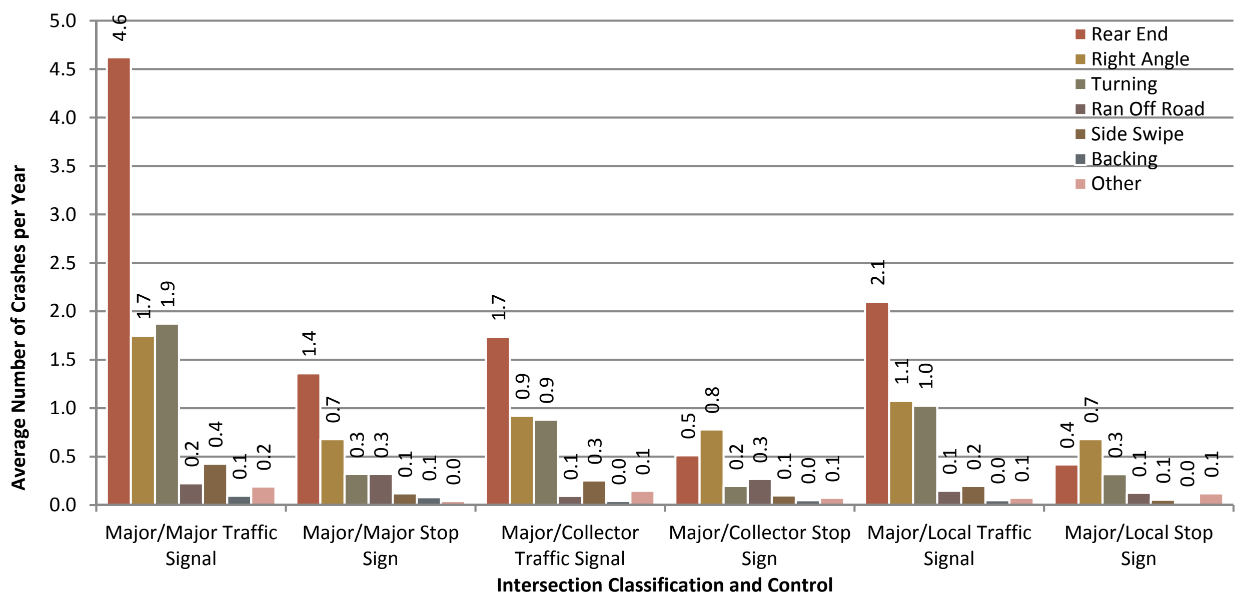


Figure 19 – Average Number of Crashes at Various Signal and Stop-Controlled Intersections

4.1 CRASH COSTS

Crashes that occurred in the City of Lincoln in 2012 resulted in nearly $280 million in capital and societal costs.

During 2012 there were 7,178 crashes reported to the Lincoln Police Department. Utilizing the total number of crashes by crash severity, a monetary value was calculated for the loss that resulted from the crashes. The loss was calculated based on the Highway Safety Manual (HSM), which uses crash costs from the Federal Highway Administration's report, *Crash Costs Estimates by Maximum Police-Reported Injury Severity within Selected Crash Geometries.* The report expressed monetary values in 2001 dollars, which have been converted to 2012 dollars according to the process outlined in HSM Appendix 4A – Crash Cost Estimates of the HSM.

The costs include all capital monetary losses related to emergency services, medical care, property damages and lost productivity. Capital losses are those in which the monetary loss can be easily quantified. In addition to the calculated capital costs, there are additional societal costs related to crashes. Societal costs include non-monetary costs associated with the reduction in a person's quality of life resulting from a crash. The loss of quality of life may include effects of permanent physical impairment, emotional trauma to those involved, and emotional trauma experienced by those who knew a victim of a crash, whether the victim was injured or killed. Table 2 summarizes the total costs calculated for each crash type based on the 2012 crash data.

Table 2 – Capital and Societal Crash Costs in 2012

Crash Type	Cost per Crash	2012 Crashes	Total Costs
Fatal	$5,360,000	11	$59,000,000
Injury	$109,000	1,691	$185,032,000
PDO	$9,650	3,502	$33,807,000
NR	$1,000	1,974	$1,974,000
Total		7,178	$279,813,000

4.2 CRASH TYPES

Figure 20 compares the number of crashes by crash type in 2012 to the previous 3-year average (2009 – 2011). The graph shows that there were generally fewer crashes of each type during 2012 when compared with the 3-year average, however, the number of rear end and side swipe crashes was higher than the average in 2012.

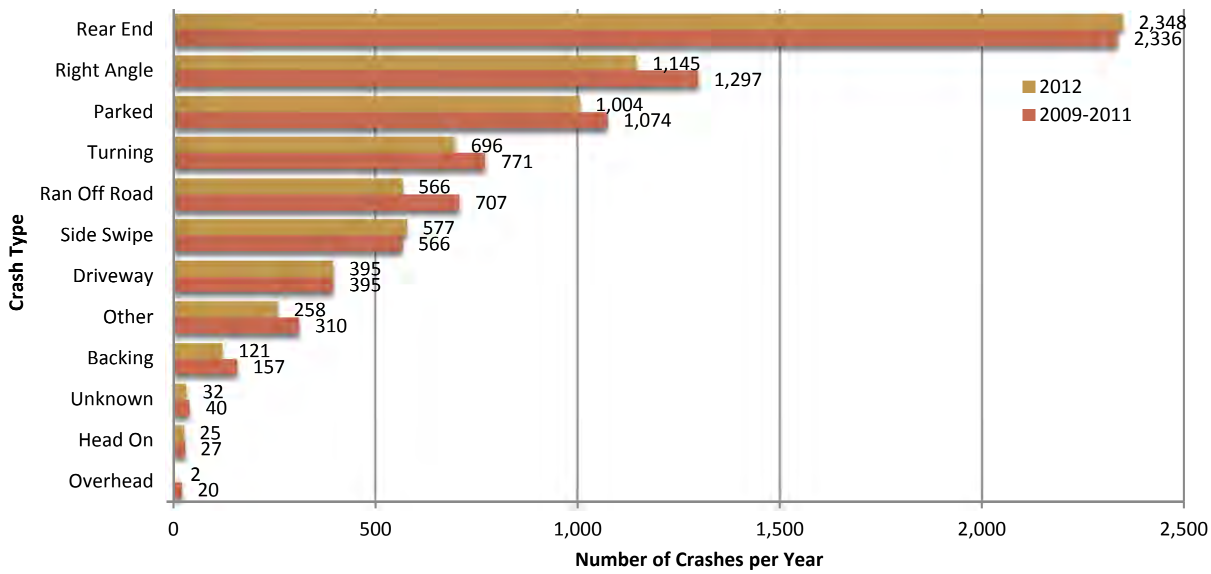


Figure 20 – Number of Crashes by Type in 2012 vs. 2009 - 2011 Average

4.3 CRASHES BY MONTH

Figure 21 provides a comparison of the crashes by month from 2012 to the previous three year average. While the number of crashes in 2012 generally mirrors that of the previous three years, the number of crashes in January and December were significantly lower than the average. This is likely due to better winter driving conditions during these months. The number of crashes in July was also 95 fewer than average (17%).

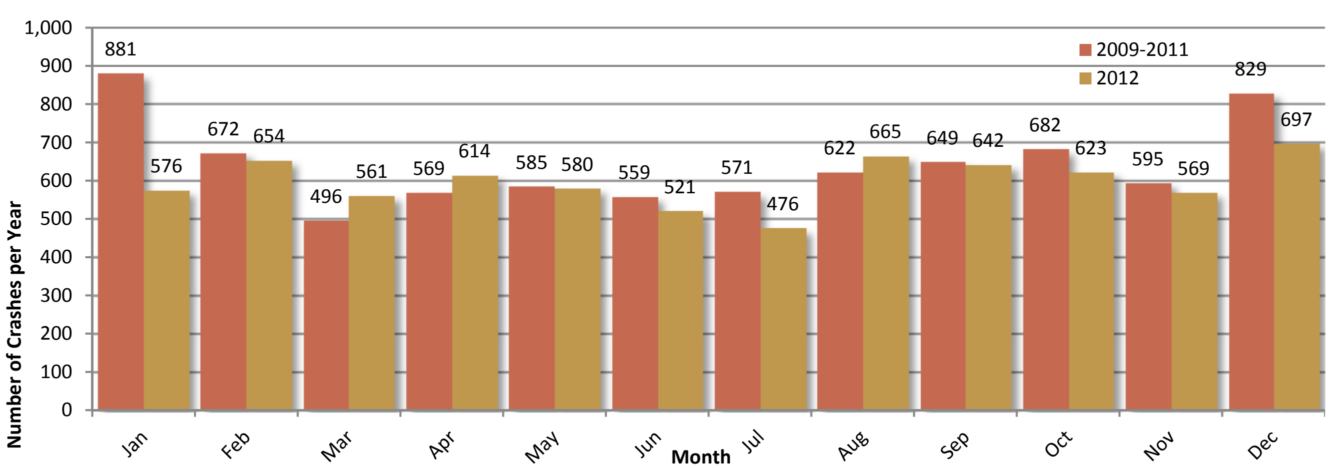


Figure 21 – Number of Crashes by Month in 2012 vs. 2009 - 2011 Average

4.4 CRASHES BY DAY OF WEEK

A comparison of the number of crashes by day of the week is shown in Figure 22. The total number of crashes for 2012 was lower than the average number of crashes per year during the last three years on each day of the week, but crashes generally followed the same trend as the average. Fridays tend to have the highest number of crashes, however, travel on Fridays is likely also the highest day of the week.

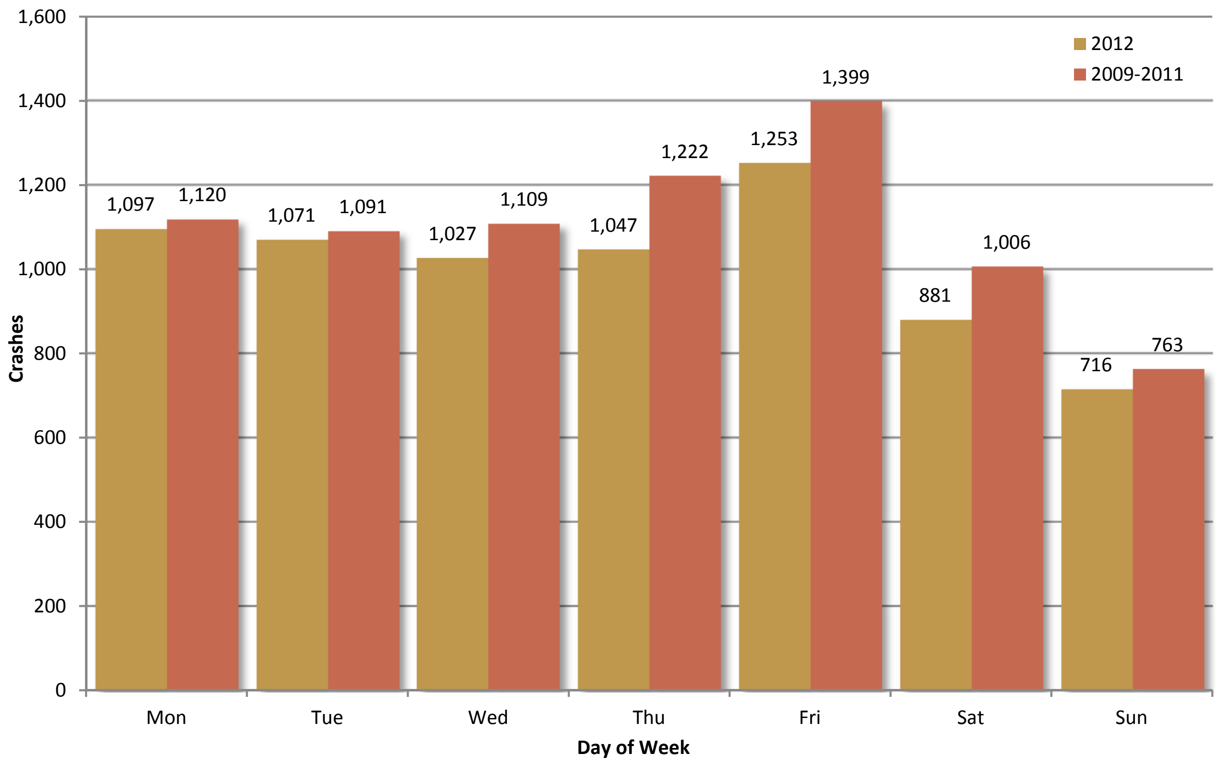


Figure 22 – Number of Crashes by Day of Week in 2012 vs. 2009 - 2011 Average

4.5 CRASHES BY TIME OF DAY

Crashes by time-of-day were analyzed for both weekday and weekend crashes, because of the differing traffic patterns that occur during the week with school and work traffic strongly influencing the traffic patterns. The graph of weekday crashes shown in Figure 23 is similar to a typical Average Daily Traffic (ADT) plot, with a peak during the morning commute time, a smaller peak around the noon hour, and a third peak that corresponds to the evening peak hour, after which it gradually tapers off. The weekend graph also shows a graph similar to ADT patterns where traffic peaks in the late morning and early afternoon, as well as a smaller spike during the late night and early morning hours (10:00 pm – 2:00 am) that can associated with people participating in various nightlife activities, which may involve alcohol or other drugs that contribute to impaired driving.

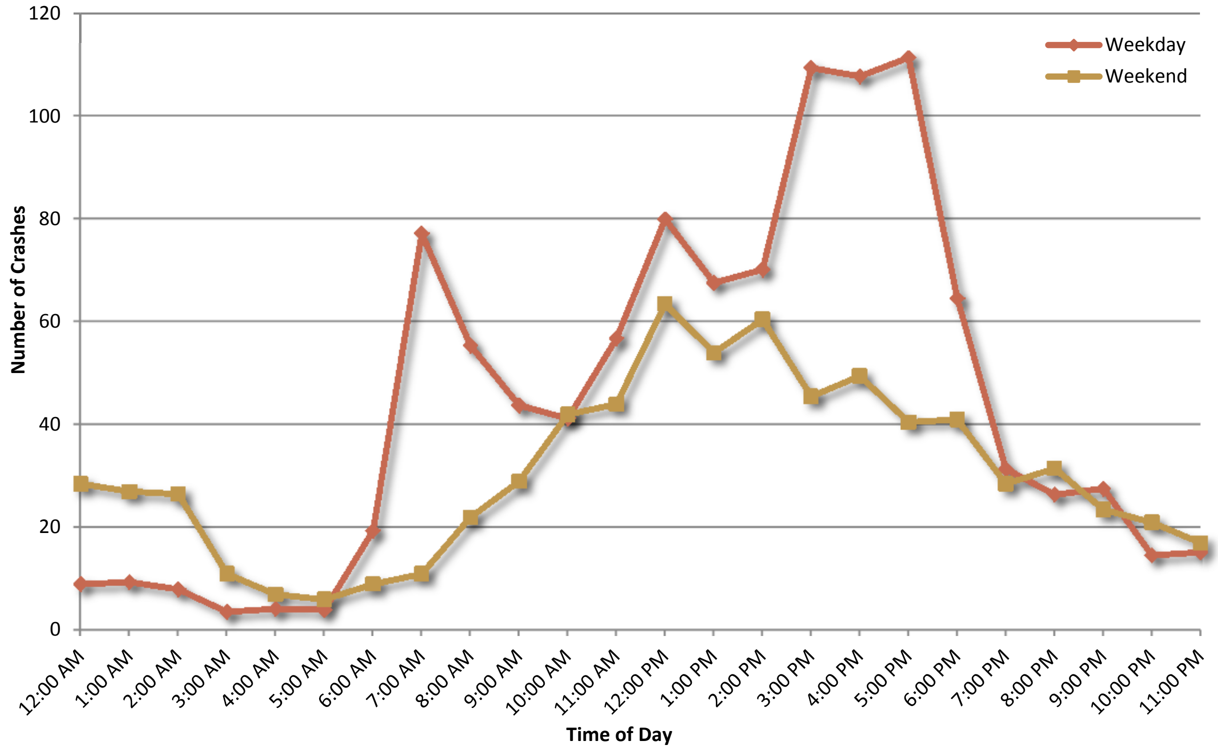


Figure 23 – Number of Crashes by Time of Day in 2012

4.6 PEDESTRIAN AND BICYCLE CRASHES

Crashes involving pedestrians and bicycles were summarized graphically by type in Figure 24 and Figure 25. The graphics provide an overview of the general pedestrian and bicycle crash trends. The total number of pedestrian and bicycle crashes account for a small fraction of the total number of crashes in the City of Lincoln based upon 2012 data. Pedestrian crashes consisted of 1.12% of the total crashes, while bicycle crashes accounted for 2.20% of the total.

Of the 86 pedestrian crashes, forty-nine (49) occurred at intersections, and was a nearly equal mix of crashes where vehicles were turning left, going straight, or turning right. Seventeen (17) crashes involved pedestrians crossing at unauthorized locations. However, in many cases, the cause of the crash or the party at fault is not available.

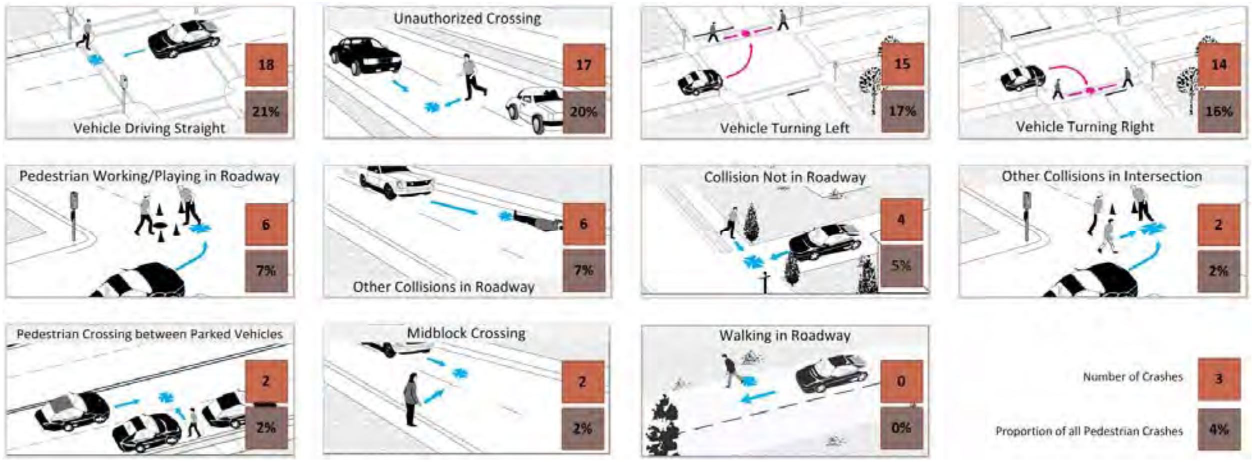


Figure 24 – Summary of Pedestrian Crashes

Of the 169 pedestrian crashes, forty-two (42) involved vehicles turning right into bicycles traveling in the same direction approaching an intersection. Sixty-seven (67) crashes were right angle crashes occurring at a mix of intersection types (signal, stop, and yield control). However, of these crashes, bicycles were in violation in 52 of the crashes, while vehicles were in violation in 15 crashes. Another common crash type involves vehicles or bicycles pulling out of alleys or driveways. Eighteen (18) crashes involved vehicles pulling out of alleys/driveways and colliding with a bicycle, while an additional nine crashes involved bicycles pulling out of alleys/driveways and colliding with a vehicle.

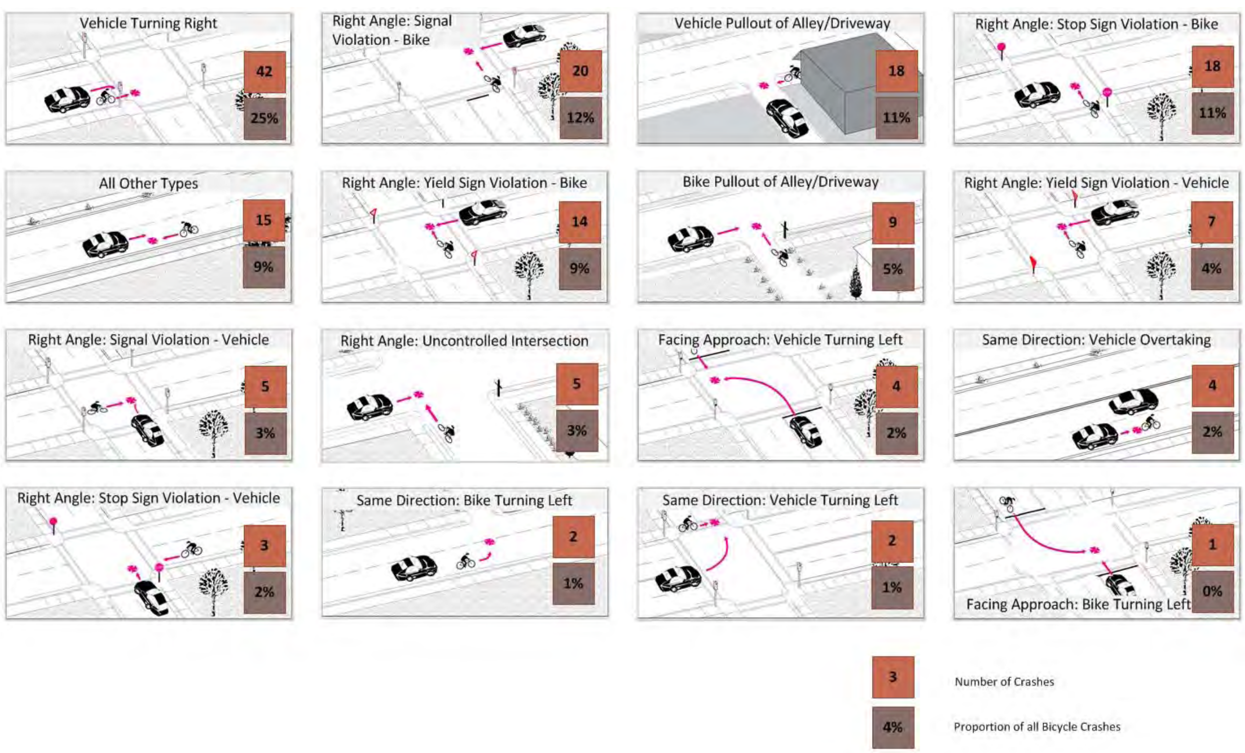


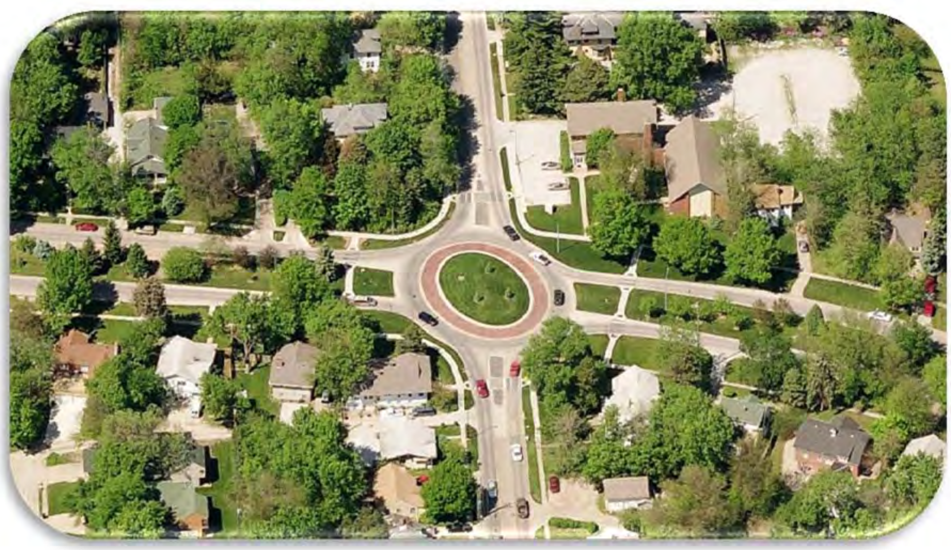
Figure 25 – Summary of Bicycle Collisions

5.0 2012 SAFETY REVIEW

For the 2012 crash study, each intersection in the City was analyzed based on three years of crash data. Intersections that have crash rates exceeding a threshold are considered for further review, including a field inspection and development of potential countermeasures. The following sections highlight the process of analyzing, reviewing, and developing countermeasures.

5.1 CRASH ANALYSIS SUMMARY

Utilizing three years of CJIS crash data (2010 – 2012), a crash rate or Equivalent Property Damage Only (EPDO) crash rate was calculated for every intersection (depending on its classification), as part of the Network Screening step of the HSM Roadway Safety Management Process. An EPDO rate is calculated in addition to a crash rate to factor in the severity of crashes that occur at an intersection. This process converts fatal, injury, and non-reportable crashes to equivalent property damage only crashes, based on the crash costs that are summarized in Table 2. Because fatal crashes are extremely rare events, fatal and injury costs are combined to determine a single EPDO factor. For 2012, one fatal/injury crash is equal to 21.8 EPDO crashes, and one non-reportable crash is equal to 0.104 EPDO crashes.



In addition, a critical rate for each intersection category was calculated based on the average crash (or EPDO) rate for the classification/control category and the intersection ADT. If the actual rate exceeds the critical rate, the intersection is considered to be a high-crash intersection. Sample rate calculations can be found in Appendix C of the Technical Appendix. Based on those rates, 75 intersections were identified as having a crash or EPDO rate that was higher than the relevant critical rate, as well as an average of five or more crashes per year. These 75 intersections are listed in Table 3. The intersections are ranked by EPDO rate or crash rate (depending on intersection category). The table lists the number of crashes by severity where:

- F+I is the number of fatal and injury crashes
- PDO is the number of property damage crashes of $1,000 or more
- NR is the number of non-reportable crashes with damages less than $1,000
- Total is the total number of crashes at the intersection

Many of the intersections listed in Table 3 have exceeded critical rates for several years, have been evaluated in detail in past crash studies, and have potential countermeasures already identified. Therefore, intersections that have never been evaluated, or that have only been evaluated once in the last three years were selected for detailed evaluation, and are highlighted in red in Table 3.

Table 3 – Intersections Exceeding Critical Rates for Years 2010-2012

LOCKEY	Intersection	ADT	Crash per Year	F+I per Year	PDO per Year	NR per Year	Crash Rate	EPDO Rate	Critical Crash Rate	Critical EPDO Rate
MAJOR/MAJOR TRAFFIC SIGNAL										
12617	N 27th St & Vine St	54,100	37.0	12.3	13.7	11.0	1.87	14.37	1.28	7.08
2641	N 11th St & Cornhusker Hwy	38,600	19.7	8.7	5.7	5.3	1.40	13.85	1.36	7.26
2757	Cotner Blvd & O St	47,735	28.3	10.3	13.3	4.7	1.63	13.72	1.31	7.14
2655	N 27th St & Cornhusker Hwy	70,850	45.3	14.3	17.3	13.7	1.75	12.81	1.23	6.96
8687	48th St & O St	56,550	39.0	11.0	15.7	12.3	1.89	12.44	1.27	7.06
8653	27th St & O St	60,500	47.3	11.3	16.3	19.7	2.14	12.02	1.26	7.03
10139	S 48th St & Randolph St	25,400	12.7	4.7	5.0	3.0	1.37	11.55	1.47	7.53
11183	S 48th St & South St	27,917	11.7	5.0	3.3	3.3	1.14	11.06	1.45	7.46
113	S 16th St & A St	16,700	6.7	3.0	1.7	2.0	1.09	11.04	1.62	7.87
11101	S 10th St & South St	27,150	13.7	4.7	7.0	2.0	1.38	10.99	1.45	7.48
12691	N 70th St & Vine St	25,100	10.0	4.3	3.0	2.7	1.09	10.67	1.48	7.54
8707	66th St & O St	41,110	15.0	7.0	3.0	5.0	1.00	10.40	1.34	7.22
171	S 56th St & A St	27,200	12.0	4.3	5.3	2.3	1.21	10.08	1.45	7.48
8865	S 70th St & Old Cheney Rd	34,450	15.3	5.3	7.3	2.7	1.22	9.85	1.39	7.33
6343	S 17th St & K St	32,500	13.7	5.0	6.7	2.0	1.15	9.77	1.40	7.36
8353	S 27th St & Nebraska Hwy	62,380	35.0	9.3	17.7	8.0	1.54	9.75	1.26	7.02
1965	S 27th St & Capitol Pkwy	48,450	26.3	7.0	10.0	9.3	1.49	9.25	1.31	7.14
8477	S 48th St & Normal Blvd	38,903	16.0	5.7	6.0	4.3	1.13	9.15	1.36	7.26
5615	N 48th St & Holdrege St	38,805	15.3	5.7	5.7	4.0	1.08	9.15	1.36	7.26
8697	56th St & O St	49,995	20.7	7.0	11.3	2.3	1.13	9.00	1.30	7.12
8371	S 84th St & Nebraska Hwy	31,100	14.7	4.3	6.3	4.0	1.29	8.92	1.41	7.39
167	S Cotner Blvd & A St	19,200	6.7	2.7	3.7	0.3	0.95	8.82	1.57	7.75
12655	N 48th St & Vine St	46,150	22.3	6.3	9.3	6.7	1.33	8.79	1.32	7.16
8843	S 40th St & Old Cheney Rd	40,450	16.3	5.7	5.7	5.0	1.11	8.79	1.35	7.23
5571	N 27th St & Holdrege St	43,650	20.7	6.0	8.0	6.7	1.30	8.76	1.33	7.19
23390	S 40th St & Pine Lake Rd	27,150	10.0	3.7	5.0	1.3	1.01	8.58	1.45	7.48
8367	S 70th St & Nebraska Hwy	34,850	13.3	4.7	7.0	1.7	1.05	8.56	1.38	7.32
321	N 48th St & Adams St	33,910	12.0	4.7	3.7	3.7	0.97	8.55	1.39	7.34
163	S 48th St & A St	29,500	11.0	4.0	3.7	3.3	1.02	8.47	1.43	7.43
135	S 27th St & A St	35,900	16.7	4.7	6.3	5.7	1.27	8.29	1.38	7.30
12631	N 33rd St & Vine St	32,900	12.7	4.3	4.0	4.3	1.05	8.24	1.40	7.36
8469	S 40th St & Normal Blvd	34,000	12.3	4.3	6.0	2.0	0.99	8.11	1.39	7.34
6341	S 16th St & K St	31,900	12.3	4.0	5.3	3.0	1.06	7.97	1.41	7.38
7033	N 56th St & Leighton Ave	18,400	5.0	2.3	2.3	0.3	0.74	7.93	1.58	7.79
8633	17th St & O St	44,000	19.0	5.3	10.3	3.3	1.18	7.90	1.33	7.19
373	N 84th St & Adams St	29,725	11.0	3.7	4.3	3.0	1.01	7.80	1.43	7.42
8711	70th St & O St	52,800	22.7	6.3	10.0	6.3	1.18	7.72	1.29	7.09
5689	N 84th St & Holdrege St	35,200	11.0	4.3	4.0	2.7	0.86	7.69	1.38	7.32
8363	S 56th St & Nebraska Hwy	53,185	25.3	5.7	15.0	4.7	1.30	7.16	1.29	7.09
MAJOR/MAJOR STOP SIGN										
10899	Sheridan Blvd & Van Dorn St	12,050	6.0	2.7	2.7	0.7	1.36	13.84	1.30	5.37
23367	N 84th St & Havelock Ave	23,100	5.3	2.3	1.7	1.3	0.63	6.25	1.08	4.90
MAJOR/MAJOR YIELD SIGN										

LOCKEY	Intersection	ADT	Crash per Year	F+I per Year	PDO per Year	NR per Year	Crash Rate	EPDO Rate	Critical Crash Rate	Critical EPDO Rate
2645	N Antelope Valley Exit Rd & Cornhusker Hwy	32,000	10.7	2.3	4.7	3.7	0.91	4.79	0.75	3.21
MAJOR/MAJOR ROUNDABOUT										
11875	N 14th St & Superior St	42,950	37.0	10.3	16.7	10.0	2.36	31.21	1.36	4.27
10911	S 33rd St & Sheridan Blvd	17,150	5.3	1.3	3.3	0.7	0.85	5.19	1.64	4.77
MAJOR/COLLECTOR TRAFFIC SIGNAL										
23255	N 27th St & Ticonderoga Dr	23,500	7.7	4.7	1.7	1.3	0.89	12.07	1.02	5.28
23532	N 27th St & Knox St	37,800	14.3	6.7	5.7	2.0	1.04	10.96	0.91	5.02
24678	S 87th St & Nebraska Hwy	25,750	11.7	3.7	4.3	3.7	1.24	9.01	0.99	5.23
24114	N 27th St & Kensington Dr	18,750	5.3	2.7	2.0	0.7	0.78	8.80	1.08	5.43
10855	S 56th St & Shady Creek Ct	29,000	6.7	4.0	1.0	1.7	0.63	8.35	0.96	5.16
8649	25th St & O St	33,350	9.7	4.3	3.3	2.0	0.79	8.05	0.93	5.08
2663	N 44th St & Cornhusker Hwy	20,500	6.3	2.7	1.3	2.3	0.85	7.98	1.03	5.00
8227	S 10th St & N St	31,100	8.7	4.0	2.7	2.0	0.76	7.94	0.93	4.76
4237	N 27th St & Folkways Blvd	21,200	6.0	2.7	2.7	0.7	0.78	7.87	1.02	4.98
12595	N 16th St & Vine St	23,950	6.7	3.0	3.0	0.7	0.76	7.83	0.99	4.90
8621	11th St & O St	25,150	10.7	3.0	5.0	2.7	1.16	7.70	0.98	4.87
2677	State Fair Park Rd & Cornhusker Hwy	39,250	15.0	4.3	7.3	3.3	1.05	7.13	0.88	4.64
8691	52nd St & O St	39,400	8.0	4.3	3.3	0.3	0.56	6.80	0.88	4.64
11879	N 20th St & Superior St	29,100	6.3	3.0	2.3	1.0	0.60	6.39	0.94	4.79
7553	S 9th St & M St	26,800	7.7	2.7	3.7	1.3	0.78	6.33	0.96	4.84
6047	S 27th St & J St	30,300	11.3	3.0	4.0	4.3	1.02	6.32	0.93	4.77
7079	N 84th St & Leighton Ave	30,905	9.0	3.0	4.0	2.0	0.80	6.17	0.93	4.76
13031	S 70th St & Wedgewood Dr	34,800	6.0	3.3	2.3	0.3	0.47	5.91	0.90	4.70
1865	S 56th St & Calvert St	26,150	7.7	2.3	4.3	1.0	0.80	5.79	0.97	4.85
3733	S 56th St & Elkcrest Dr	25,700	5.0	2.3	1.3	1.3	0.53	5.58	0.97	4.86
6653	S 11th St & L St	16,300	5.3	1.3	2.7	1.3	0.90	5.36	1.10	5.16
1959	Capitol Pkwy & J St	30,000	5.3	2.3	3.0	0.0	0.49	4.92	0.94	4.78
4095	N 27th St & Fairfield St	39,950	11.7	3.0	4.7	4.0	0.80	4.83	0.88	4.64
MAJOR/COLLECTOR STOP SIGN										
263	N 1st St & Adams St	11,150	5.3	1.7	2.7	1.0	1.31	9.61	0.97	3.90
11129	S 20th St & South St	19,850	5.0	2.0	2.3	0.7	0.69	6.35	0.79	3.52
8259	S 27th St & N St	29,350	5.7	1.7	3.3	0.7	0.53	3.71	0.70	3.33
MAJOR/LOCAL STOP SIGN										
117	S 18th St & A St	12,700	7.7	2.7	3.7	1.3	1.65	13.36	0.81	3.46
11929	S 40th St & Sweetbriar Ln	14,500	5.7	1.7	3.3	0.7	1.07	7.51	0.77	3.37
24598	S 91st St & Nebraska Hwy	18,350	5.0	3.3	1.3	0.3	0.75	11.05	0.71	3.23
8689	50th St & O St	37,300	9.3	5.0	3.0	1.3	0.69	8.24	0.57	2.91
COLLECTOR/COLLECTOR STOP SIGN										
8249	S 21st St & N St	8,000	6.3	3.0	2.3	1.0	2.17	23.23	1.87	7.69

5.2 CRASH COUNTERMEASURES

For all of the selected intersections highlighted in Table 3, collision diagrams were developed in accordance with the Diagnosis step of the HSM Roadway Safety Management Process. The completed collision diagrams were used to identify crash patterns. With crash patterns identified for each intersection, a field review was conducted to determine what, if any, contributing factors are present at the intersection related to the crash patterns identified. Identifying the contributing factors completed the Diagnosis step in the HSM Roadway Safety Management Process.

The next step, after diagnosing the contributing factors, was to select identify potential countermeasures. Countermeasures were selected to address the safety issues related to the contributing factors for each intersection identified during the field review. Depending on the intersection and contributing factor(s), there may have been more than one countermeasure identified to address a specific contributing factor.

After an initial list of countermeasures was identified, a workshop was held with City staff to identify the feasibility and other potential issues. Based on discussion at this workshop, a final list of countermeasures was developed and an economic analysis was conducted. The economic analysis quantified the cost of implementation, as well as the benefits of each potential improvement option by assigning an expected reduction in crashes for each countermeasure. From this data, a total net benefit and benefit-to-cost ratios were calculated. Finally, based upon the analysis, engineering judgment, and benefit/cost ratios, a top countermeasure was identified for each intersection. These top countermeasures are highlighted in the table and represent a likely first step, or best-fix to the intersection.

Table 4 summarizes the countermeasures proposed for the intersections evaluated in Table 3. Crash statistics, aerial photographs, collision diagrams, approach photographs, and countermeasure summaries for each intersection can be found in Appendix A of the Technical Appendix. Additional countermeasure details can be found in Appendix D of the Technical Appendix.

Table 4 – Countermeasures Identified in 2012

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
113	S 16th St & A St	Rear End, Right Angle	Review signal timing clearance intervals	3	$500	$45,300	252.7
113	S 16th St & A St	EB Rear Ends	Update signal timing to improve EB coordination with 17th St in the afternoon	3	$1,000	$14,800	43.3
12691	N 70th St & Vine St	All Crash Patterns	Consider Roundabout Implementation	20	$1,000,000	$696,270	11.4
12691	N 70th St & Vine St	NB Rear Ends	Trim tree canopy, NB, south of E. Eldora Ln	2	$500	$36,300	140.6
12691	N 70th St & Vine St	EB & NB Rear Ends	Review signal timing clearance intervals	3	$500	$96,970	539.7
12691	N 70th St & Vine St	EB & NB Rear Ends	Consider closing driveways on northeast corner	20	$25,000	$64,930	39.6
12691	N 70th St & Vine St	EB & NB Rear Ends	Add exclusive EB right turn lane	20	$100,000	$115,530	18.2
171	S 56th St & A St	NB Crashes	Add additional NB signal head (5-section with overlap)	15	$2,000	$127,790	752.7
171	S 56th St & A St	Right Angle	Review signal timing clearance intervals	3	$500	$99,290	552.6
171	S 56th St & A St	All Crash Patterns	Consider Roundabout Implementation	20	$600,000	$797,210	20.8
171	S 56th St & A St	Rear Ends	Install advance warning flashing beacons on EB approach	10	$4,000	$109,290	233.5
171	S 56th St & A St	Left Turns	Install flashing yellow arrow	15	$8,000	$25,720	39.4
171	S 56th St & A St	WB Crashes	Install exclusive WB right turn lane	20	$100,000	$35,700	6.3

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
171	S 56th St & A St	SB Crashes	Install carrot striping for the SB left turn lane	3	$500	$3,930	22.8
6343	S 17th St & K St	NB & EB Right Angle	Install additional signal head for EB on pole on NE corner of intersection	15	$2,000	$348,450	2,050.7
6343	S 17th St & K St	NB & EB Right Angle	Review signal timing clearance intervals	3	$500	$106,710	593.8
6343	S 17th St & K St	NB & EB Right Angle	Modify progression in the EB and NB directions	3	$1,000	$106,540	305.4
6343	S 17th St & K St	NB & EB Right Angle	Convert left-most through lane to a shared left/through lane (add markings signage as appropriate)	3	$1,000	$750	3.1
6343	S 17th St & K St	NB & EB Right Angle	Consider speed limit adjustments approaching downtown	3	$1,000	$106,540	305.4
8371	S 84th St & Nebraska Hwy	EB & WB Rear End	Review signal timing clearance intervals	3	$500	$92,130	512.8
8371	S 84th St & Nebraska Hwy	EB & WB Rear End	Install speed feedback signs with strobes	10	$12,000	$86,870	62.6
8371	S 84th St & Nebraska Hwy	EB & WB Rear End	Consider reducing speed limit along Highway 2	20	$5,000	$93,990	277.4
8371	S 84th St & Nebraska Hwy	EB & WB Rear End	Consider lead/lag left turns for the EB and WB left turn movements	10	$1,000	$88,160	735.7
167	S Cotner Blvd & A St	WB Rear End	Replace or adjust left-hand signal head on WB approach	15	$2,000	$41,640	245.9
167	S Cotner Blvd & A St	WB Rear End	Add signal head on pole for WB approach	15	$2,000	$41,640	245.9
167	S Cotner Blvd & A St	WB Rear End	Review signal timing clearance intervals	3	$500	$45,860	255.8
167	S Cotner Blvd & A St	WB Rear End	Install advance warning flashing beacon on WB approach	10	$4,000	$80,320	171.9
167	S Cotner Blvd & A St	All Crash Patterns	Consider installing roundabout	20	$1,000,000	$389,630	6.8
8843	S 40th St & Old Cheney Rd	Left Turn & Right Angle	Review signal timing clearance intervals	3	$500	$121,870	678.1
8843	S 40th St & Old Cheney Rd	Rear Ends	Install 5-section heads on all poles and add right turn overlaps	15	$8,000	$42,670	64.7
8843	S 40th St & Old Cheney Rd	EB & WB Left Turn	Convert EB and WB left turns to protected-only mode, implement dual lanes	6	$10,000	$339,550	184.5
23390	S 40th St & Pine Lake Rd	EB Rear End	Open second EB left turn lane and convert to protected-only	6	$5,000	$350,260	381.7
23390	S 40th St & Pine Lake Rd	SB Crashes	Trim trees on SB approach (blocking pole mount signal head)	2	$500	$7,570	30.1
23390	S 40th St & Pine Lake Rd	All Crash Patterns	Review signal timing clearance intervals	3	$500	$84,370	469.7
8367	S 70th St & Nebraska Hwy	Right Angle	Review signal timing clearance intervals	3	$500	$114,530	637.3
8367	S 70th St & Nebraska Hwy	EB Rear End	Reduce speed on Highway 2	20	$5,000	$94,880	280.1
8367	S 70th St & Nebraska Hwy	EB Left Turn	Convert EB left turn (and WB left turn) to protected-only mode. Consider the same for NB and SB left turns.	6	$20,000	$204,810	56.5
321	N 48th St & Adams St	Left Turn	Review signal timing clearance intervals	3	$500	$88,750	494.1

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
321	N 48th St & Adams St	All Crash Patterns	Consider Roundabout Implementation	20	$600,000	$902,720	23.4
321	N 48th St & Adams St	Bike	Prohibit EB right turns on red	10	$6,000	$29,670	43.4
321	N 48th St & Adams St	Rear Ends	Implement access control on EB and NB approaches	20	$25,000	$33,970	21.2
321	N 48th St & Adams St	Right Turns	Convert EB shared through/right lane to an exclusive right turn lane, and stripe out departure lane	3	$2,000	$65,410	93.1
321	N 48th St & Adams St	Left Turns	Install flashing yellow arrows on all approaches	15	$8,000	$47,070	71.3
12631	N 33rd St & Vine St	Right Angle	Install additional signal head for NB and SB approaches	15	$2,000	$73,790	435.1
12631	N 33rd St & Vine St	Right Angle	Implement new mastarm signal upgrade	15	$150,000	$61,390	5.9
12631	N 33rd St & Vine St	Left Turns	Implement flashing yellow arrow operation on all approaches	15	$8,000	$121,520	182.4
12631	N 33rd St & Vine St	Left Turn & Right Angle	Review signal timing clearance intervals	3	$500	$82,920	461.7
12631	N 33rd St & Vine St	All Crash Patterns	Consider Roundabout Implementation	20	$600,000	$785,000	20.5
12631	N 33rd St & Vine St	NB & SB Left Turns	Convert outside NB and SB lanes to exclusive right turn lanes, eliminate outside departure lanes	3	$4,000	$43,930	32.2
7033	N 56th St & Leighton Ave	Right Angle	Trim trees on all approaches	2	$500	$51,010	197.2
7033	N 56th St & Leighton Ave	Right Angle	Review signal timing clearance intervals	3	$500	$59,010	328.8
7033	N 56th St & Leighton Ave	Right Angle	Consider Roundabout Implementation	20	$600,000	$460,890	12.4
5689	N 84th St & Holdrege St	NB & SB Rear Ends	Add signal heads on NB and SB approaches	15	$4,000	$32,760	97.4
5689	N 84th St & Holdrege St	NB & SB Rear Ends	Review signal timing clearance intervals	3	$500	$97,960	545.2
5689	N 84th St & Holdrege St	Left Turns	Install flashing yellow arrow on NB and SB approaches and operate prot-only by TOD	15	$4,000	$96,220	284.0
10899	Sheridan Blvd & Van Dorn St	SB Right Angle	Prohibit parking on west side of north leg	6	$100	$41,980	2,100.0
10899	Sheridan Blvd & Van Dorn St	All Crash Patterns	Consider Roundabout Implementation	20	$1,000,000	$351,630	6.2
10899	Sheridan Blvd & Van Dorn St	EB Rear End	Install Stop Ahead (W3-1) in advance of intersection	6	$100	$22,880	1,145.0
23367	N 84th St & Havelock Ave	EB Rear End	Review signal timing clearance intervals	3	$500	$51,820	288.9
23367	N 84th St & Havelock Ave	EB Rear End	Check split time for EB approach in PM, install detection if necessary	3	$1,000	$7,640	22.8
10911	S 33rd St & Sheridan Blvd	SB/WB Enter/Circulate	Trim trees on NB and SB approaches	2	$500	$24,260	94.3
10911	S 33rd St & Sheridan Blvd	All Crash Patterns	Maintain pavement markings (most are gone/faded)	3	$2,000	$162,190	229.4
24678	S 87th St & Nebraska Hwy	EB & WB Rear End	Review signal timing clearance intervals	3	$500	$82,590	459.8

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
24678	S 87th St & Nebraska Hwy	SB Right Turn	Add dual right turn lane control sign on mast arm to supplement near side	6	$100	$1,710	86.5
24678	S 87th St & Nebraska Hwy	EB & WB Rear End	Reduce speed on Highway 2	20	$5,000	$90,230	266.4
10855	S 56th St & Shady Creek Ct	SB	Add signal head on pole for SB approach	15	$2,000	$79,560	469.0
10855	S 56th St & Shady Creek Ct	SB	Review signal timing clearance intervals	3	$500	$73,130	407.3
10855	S 56th St & Shady Creek Ct	WB Left Turn	Add lane control sign next to left turn signals	6	$100	$7,770	389.5
8649	25th St & O St	EB Rear End	Adjust signal timing at 27th Street to prevent queue spillback	3	$1,000	$22,460	65.2
8649	25th St & O St	NB Right Angle	Review signal timing clearance intervals	3	$500	$104,750	582.9
8649	25th St & O St	NB Right Angle	Update NB split if necessary	3	$1,000	$44,330	127.7
8649	25th St & O St	All Crash Patterns	Conduct signal warrants analysis, consider removing signal	20	$10,000	$117,550	176.4
2663	N 44th St & Cornhusker Hwy	Rear End and Right Angle	Review signal timing clearance intervals	3	$500	$44,810	249.9
2663	N 44th St & Cornhusker Hwy	Rear End	Add signal head on pole for EB and WB approaches	15	$2,000	$48,680	287.4
2663	N 44th St & Cornhusker Hwy	Rear End	Install stop line on EB and WB approaches	3	$100	$89,790	2,245.8
2663	N 44th St & Cornhusker Hwy	na	Push button on NW corner of intersection not working	5	$1,000	-$220	0.0
2663	N 44th St & Cornhusker Hwy	All Crash Patterns	Conduct signal warrants analysis, consider removing signal	20	$10,000	$57,980	87.5
12595	N 16th St & Vine St	Bike crashes	Implement an exclusive pedestrian phase	15	$5,000	$78,340	187.5
12595	N 16th St & Vine St	WB Left Turn	Review signal timing clearance intervals	3	$500	$60,310	336.1
12595	N 16th St & Vine St	WB Left Turn	Convert EB approach to exclusive EBT and exclusive EBR	6	$500	$15,730	175.8
12595	N 16th St & Vine St	Bike and Ped Crashes	Implement bulbouts on south leg (both sides)	15	$20,000	$29,820	18.8
8691	52nd St & O St	EB & WB Left Turn	Review signal timing clearance intervals	3	$500	$95,770	533.1
8691	52nd St & O St	EB & WB Left Turn	Implement protected-only left turn phases on EB and WB approaches	6	$10,000	$273,100	148.6
7079	N 84th St & Leighton Ave	None	No countermeasures recommended				
13031	S 70th St & Wedgewood Dr	NB Rear End	Install additional signal head on NB and SB approaches	15	$4,000	$72,940	215.5
13031	S 70th St & Wedgewood Dr	NB Rear End	Review signal timing clearance intervals	3	$500	$74,430	414.5
1865	S 56th St & Calvert St	NB & SB Left Turn & Rear End	Implement NB and SB left turn lanes	20	$550,000	$219,080	6.9
1865	S 56th St & Calvert St	All Crash Patterns	Consider Roundabout Implementation	20	$600,000	$427,960	11.6
1865	S 56th St & Calvert St	NB and SB Left Turn	Convert to three-lane section with two-way left-turn lane	15	$100,000	$97,920	12.7

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
3733	S 56th St & Elkcrest Dr	NB Rear End	Install NB right turn lane	20	$50,000	$39,440	12.7
3733	S 56th St & Elkcrest Dr	Right Angle	Review signal timing clearance intervals	3	$500	$44,630	248.9
6653	S 11th St & L St	SB & WB Right Angle	Implement new mastarm signal upgrade	15	$150,000	$64,970	6.2
6653	S 11th St & L St	SB & WB Right Angle	Install additional signal heads on SB and WB approaches	15	$4,000	$25,510	76.0
1959	Capitol Pkwy & J St	Bike	Move ped crosswalk closer to intersection	3	$1,000	$43,000	123.9
1959	Capitol Pkwy & J St	SB Left Turn	Review signal timing clearance intervals	3	$500	$31,370	175.3
1959	Capitol Pkwy & J St	SB Left Turn	Install near side signal head on NB approach	15	$2,000	$18,070	107.3
1959	Capitol Pkwy & J St	SB Left Turn	Move left turn lane futher into median to improve sight and clearance distance	20	$25,000	$46,320	28.6
1959	Capitol Pkwy & J St	SB Left Turn	Convert SBL to protected-only mode (may need duals)	6	$5,000	$77,730	85.5
4095	N 27th St & Fairfield St	SB Rear End	Heavy SBR truck movements, consider SB right-turn lane	20	$60,000	$78,250	20.4
4095	N 27th St & Fairfield St	Rear End	Review signal timing clearance intervals	3	$500	$62,640	349.0
4095	N 27th St & Fairfield St	Rear End	Improve coordination with adjancent signals	3	$1,000	$55,140	158.5
11129	S 20th St & South St	EB & WB Rear End	Relocate pedestrian signal away to midblock location	15	$40,000	$81,010	25.2
11129	S 20th St & South St	Right Angle and Rear End	Review signal timing clearance intervals	3	$500	$15,330	86.2
11129	S 20th St & South St	Right Angle and Rear End	Trim trees for SB approach looking left	2	$500	$7,570	30.1
11129	S 20th St & South St	Right Angle and Rear End	Install pedestrian hybrid beacon	15	$50,000	$29,550	8.1
11129	S 20th St & South St	Right Angle and Rear End	Consider roundabout implemenation	20	$600,000	$342,010	9.5
8259	S 27th St & N St	Rear End	No countermeasures recommended				
24598	S 91st St & Nebraska Hwy	Right Angle	Signal currently under design	15	$200,000	$617,610	37.9
24598	S 91st St & Nebraska Hwy	Right Angle	Reduce speed on Highway 2	20	$5,000	$81,520	240.8

For intersections listed in Table 3 but not evaluated in detail in 2012, countermeasures that have been identified in previous crash studies are summarized in Table 5.

Table 5 – Countermeasures Identified in Previous Crash Studies

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
12617	N 27th St & Vine St	NB Rear End	Update signal timing to improve coordination	3	$1,000	$46,500	133.9
12617	N 27th St & Vine St	SB Left Turn	Implement flashing yellow arrow signal indications on all approaches	15	$8,000	$254,950	381.5
12617	N 27th St & Vine St	NB Rear End & SB Left Turn	Review signal timing clearance intervals	3	$500	$272,470	1514.7
12617	N 27th St & Vine St	NB Rear End	Construct an exclusive NB right turn lane (note: cost does not include ROW acquisition)	20	$100,000	$256,270	39.1
2641	N 11th St & Cornhusker Hwy	WB Rear End	Install "Be Prepared to Stop" (W3-4), "When Flashing" (W16-13P), and flashing beacons approximately 1200 feet in advance of intersection	10	$10,000	$278,380	238.9
2757	Cotner Blvd & O St	EB Rear End & EB Right Angle	Install additional pole-mounted signal head for EB approach	15	$2,000	$80,390	473.9
2757	Cotner Blvd & O St	EB Rear End & NB Right Angle	Review signal timing clearance intervals	3	$500	$185,260	1030.2
2655	N 27th St & Cornhusker Hwy	SB Rear End	Update signal timing to improve coordination in both NB/SB and EB/WB directions	3	$1,000	$142,250	407.4
2655	N 27th St & Cornhusker Hwy	SB Rear End	Extend SB right turn lane through access drive on SB approach	20	$75,000	$23,450	5.7
2655	N 27th St & Cornhusker Hwy	NB/SB/EB Rear End	Review signal timing clearance intervals	3	$500	$142,420	792.2
2655	N 27th St & Cornhusker Hwy	NB/SB/EB Rear End	Implement lane geometric signing for dual left turns	6	$600	$125,500	1141.9
8687	48th St & O St	EB/WB Rear End	Update signal timing to improve coordination	3	$1,000	$179,740	514.5
8687	48th St & O St	EB/WB/SB Rear End	Review signal timing clearance intervals	3	$500	$229,740	1277.3
8653	27th St & O St	NB/SB Rear End	Update signal timing to improve coordination on the NB and SB approaches	3	$1,000	$71,880	206.4
8653	27th St & O St	WB Rear End	Implement lane geometric signing for dual left turns	6	$300	$89,770	1497.2
8653	27th St & O St	All Rear End	Construct exclusive right turn lanes on all approaches (note: cost does not include ROW acquisition)	20	$500,000	$993,690	30.6
10139	S 48th St & Randolph St	SB Rear End	Install static Signal Ahead (W3-3) sign	6	$100	$91,630	4582.5
10139	S 48th St & Randolph St	SB Rear End	Update signal timing to improve coordination	3	$1,000	$89,330	256.2
10139	S 48th St & Randolph St	SB Rear End	Consider Roundabout Implementation	20	$1,000,000	$1,071,430	16.9
11183	S 48th St & South St	SB Rear End	Install "Stop Here on Red" (R10-6) sign on SB approach	6	$300	$24,330	406.5
11183	S 48th St & South St	SB Rear End	Review signal timing clearance intervals	3	$500	$89,810	499.9

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
11183	S 48th St & South St	SB Rear End	Consider Roundabout Implementation	20	$1,000,000	$640,030	10.5
11101	S 10th St & South St	NB Right Angle	Review signal timing clearance intervals	3	$500	$28,660	160.2
8707	66th St & O St	SB Rear End	Review signal timing clearance intervals	3	$500	$110,490	614.8
8865	S 70th St & Old Cheney Rd	EB Rear End	Install new EB mast arm, convert EB and WB left turns to protected-only mode, and provide dual left turns to accommodate volumes	20	$20,000	$21,570	17.1
8865	S 70th St & Old Cheney Rd	EB Rear End	Install advance warning signs with flashing beacons on EB approach	10	$4,000	$8,100	18.2
8865	S 70th St & Old Cheney Rd	WB Rear End	Construct exclusive WB right turn lane (as part of Old Cheney Rd improvement to east)	20	$75,000	$239,460	48.5
8865	S 70th St & Old Cheney Rd	EB/WB Rear End	Review signal timing clearance intervals	3	$500	$179,500	998.2
8353	S 27th St & Nebraska Hwy	EB/WB Rear End	Install "Be Prepared to Stop" (W3-4), "When Flashing" (W16-13P), and flashing beacons	10	$40,000	$150,970	33.2
8353	S 27th St & Nebraska Hwy	EB/WB Rear End	Update signal timing to improve coordination	3	$1,000	$73,730	211.7
8353	S 27th St & Nebraska Hwy	NB Rear End	Install static Signal Ahead (W3-3) sign	6	$100	$50,700	2536.0
8353	S 27th St & Nebraska Hwy	NB Rear End	Implement 2nd NB through lane to Woods Blvd	20	$300,000	$258,410	13.8
8353	S 27th St & Nebraska Hwy	NB & SB Rear End	Review signal phase sequences on NB and SB approaches to reduce queue spillback.	3	$1,000	$95,710	274.5
8353	S 27th St & Nebraska Hwy	SB Rear End	Install static Signal Ahead (W3-3) sign	6	$100	$47,440	2373.0
1965	S 27th St & Capitol Pkwy	NB/SB/WB Rear End	Review signal timing clearance intervals	3	$500	$249,120	1385.0
1965	S 27th St & Capitol Pkwy	EB Left Turn	Construct offset left turn lanes. In the short-term, convert EB left turn to protected-only mode (convert WB also to operate lead/lag left turns)	15	$10,000	$442,930	528.3
1965	S 27th St & Capitol Pkwy	NB/SB Rear End	Update signal timing to improve coordination in the NB and SB direction	3	$1,000	$133,200	381.6
1965	S 27th St & Capitol Pkwy	NB Rear End	Implement lane control signing for dual left turns in median taper and nose	6	$200	$68,760	1720.0
8477	S 48th St & Normal Blvd	EB Rear End	Install additional signal head on mast arm for EB approach	15	$2,000	$51,530	304.1
8477	S 48th St & Normal Blvd	EB Rear End & SB Right Angle	Review signal timing clearance intervals	3	$500	$180,700	1004.9
5615	N 48th St & Holdrege St	SB Rear End	Review signal timing clearance intervals	3	$500	$137,140	762.9
5615	N 48th St & Holdrege St	All Crashes	Consider roundabout implementation	20	$1,000,000	$1,089,040	17.2
8697	56th St & O St	SB/WB Right Angle	Add WB and SB signal heads on mast arms or poles	15	$4,000	$382,440	1125.8
8697	56th St & O St	SB Right Angle & EB Rear End	Review signal timing clearance intervals	3	$500	$164,680	915.9

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
12655	N 48th St & Vine St	NB Rear End	Implement exclusive NB right turn lane, and install pole-mounted signal and NB right turn overlap	20	$75,000	$256,780	51.9
12655	N 48th St & Vine St	NB Rear End	Consolidate access points on NB approach	20	$25,000	$50,680	31.2
12655	N 48th St & Vine St	NB/EB Rear End	Review signal timing clearance intervals	3	$500	$115,980	645.3
5571	N 27th St & Holdrege St	NB Rear End	Construct an exclusive NB right turn lane and overlap with WB left turn phase	20	$100,000	$238,360	36.5
5571	N 27th St & Holdrege St	SB Left Turn & NB Rear End	Review signal timing clearance intervals	3	$500	$137,660	765.8
163	S 48th St & A St	SB Rear End	Trim overhanging trees	1	$500	$44,370	86.3
163	S 48th St & A St	SB Rear End	Install static Signal Ahead (W3-3) sign	6	$100	$46,530	2327.5
163	S 48th St & A St	SB Rear End	Update signal timing to improve coordination	3	$1,000	$45,300	130.4
163	S 48th St & A St	SB Rear End	Consider Roundabout Implementation	20	$1,000,000	$717,400	11.7
135	S 27th St & A St	EB Rear End	Review signal timing clearance intervals	3	$500	$136,040	756.8
8469	S 40th St & Normal Blvd	NB Rear End	Review signal timing clearance intervals	3	$500	$134,840	750.1
6341	S 16th St & K St	SB Left Turn	Prohibit SB left turns on red	6	$100	$11,200	561.0
6341	S 16th St & K St	SB & EB Right Angle	Replace eastbound signal heads on 17th St with louvered heads	15	$10,000	$51,710	62.6
6341	S 16th St & K St	SB Left Turn	Implement lane geometric signing on mast arm	6	$200	$2,200	56.0
6341	S 16th St & K St	SB Left Turn	Improve dotted lane lines for SB left turn lanes	3	$500	$2,020	12.2
6341	S 16th St & K St	SB Left Turn	Install additional pole-mounted signal head for SB left turn lane	15	$2,000	$6,990	42.1
8633	17th St & O St	NB Right Angle	Review signal timing clearance intervals	3	$500	$115,360	641.9
8633	17th St & O St	EB Right Angle	Install additional signal head on mast arm for EB approach	15	$2,000	$80,280	473.2
8633	17th St & O St	NB Right Angle	Install new mast arm and additional signal head on NB approach	15	$10,000	$154,250	184.6
8633	17th St & O St	NB Left Turn	Install lane control signs on mast arm for NB left turn and adjacent through lane	6	$100	$46,740	2338.0
373	N 84th St & Adams St	EB Rear End	Modify EB right turn overlap to display green arrow immediately after circular green if NB left turn phase is next	15	$1,000	$27,070	339.4
8711	70th St & O St	NB Rear End	Extend NB departure lane to Vine Street	20	$450,000	$475,500	16.7
8711	70th St & O St	NB Rear End	Review signal timing for NB queue clearing	3	$1,000	$89,750	257.4
8363	S 56th St & Nebraska Hwy	EB Left Turn & EB Rear End	Construct dual EB left turn lanes, install new EB mast arm, and convert EB (and WB) left turns to protected-only mode	15	$600,000	$857,730	18.1

Lockey	Intersection	Crash Pattern	Countermeasure	Service Life	Estimated Initial Cost	Net Annual Benefit	Benefit Cost Ratio
8363	S 56th St & Nebraska Hwy	SB Right Turn	Signalize SB right turn movement and overlap with EB left turn movement	15	$15,000	$133,380	106.9
2645	N 14th St & Cornhusker Hwy	All Crashes	Major geometric/capacity project is already planned				
23255	N 27th St & Ticonderoga Dr	none	No deficiencies observed				
23532	N 27th St & Knox St	SB Rear End	Review signal timing clearance intervals	3	$500	$92,690	515.9
24114	N 27th St & Kensington Dr	Right Angle	Review signal timing clearance intervals	3	$500	$88,510	492.7
8227	S 10th St & N St	NB Rear End & NB/WB Right Angle	New traffic signal recently constructed, continue to monitor crash patterns				
4237	N 27th St & Folkways Blvd	none	No deficiencies observed				
8621	11th St & O St	EB Rear End	No deficiencies observed				
2677	State Fair Park Rd & Cornhusker Hwy	Rear End	Review signal timing clearance intervals	3	$500	$113,580	632.0
11879	N 20th St & Superior St	EB Left Turn	Install flashing yellow arrow signal head for EB left turn	15	$2,000	$73,790	435.1
7553	S 9th St & M St	SB Rear End & SB Left Sideswipe	Convert SB shared through/left lane to exclusive through, remove parking north of "M" St (east side), and add pedestrian node on SE corner	20	$30,000	$392,060	195.1
6047	S 27th St & J St	EB Right Angle	Trim/remove shrubs on NW corner	1	$500	$44,160	85.9
6047	S 27th St & J St	EB Right Angle	Review signal timing clearance intervals	3	$500	$47,150	262.9
263	N 1st St & Adams St	All Crashes	Intersection currently under reconstruction				
117	S 18th St & A St	SB Right Angle	Prohibit parking on north side of A St east of 18th St, near intersection	6	$100	$181,250	9063.5
117	S 18th St & A St	NB/SB Right Angle	Move stop sign closer to intersection and install stop line on NB and SB approaches	3	$400	$177,650	1269.9
11929	S 40th St & Sweetbriar Ln	Right Angle & Left Turn	Close median and convert to right-in/right-out access	10	$20,000	$631,360	270.8
8689	50th St & O St	EB Left Turn	Modify EB left turn median & alignment	10	$10,000	$584,390	500.5
8689	50th St & O St	EB Left Turn	Close EB left turn median opening	20	$20,000	$1,124,870	840.5

6.0 SAFETY EFFECTIVENESS EVALUATION

In order for countermeasures to be implemented, the project must be prioritized with other capital improvements and funding must be identified. As noted earlier, the City of Lincoln has been able to implement many of the countermeasures identified in earlier crash reports using federal funding. While other countermeasures may not yet have been implemented, they may be programmed for implementation in the future. Table 6, which was taken from the 2040 Long Range Transportation Plan, identifies the two on-going funding programs for safety projects.

Table 6 – 2040 Long Range Transportation Plan Capital Roadway Projects and Prioritizations

Facility/Project Name	Lead Agency	Project Type	Project Cost (Current Dollars)
MPO Programs			
Intersection Capacity Improvement Projects	Local	Program	$29,000,000
Two Plus Center Turn Lane Projects in the Built Environment (added capacity portion of projects)	Local	Program	$4,212,000
Intelligent Transportation System Capital Program of Projects	Local	Program	$25,375,000
Safety Projects (20% Local share for State safety program)	Local	Program	$5,800,000
Safety Projects (80% State share for State safety program)	State	Program	$23,200,000
Travel Demand Management Program of Projects	Local	Program	$5,800,000
East Beltway, I-80 to Hwy-2, " Corridor Protection" Freeway	Local	Corridor Protection	$7,250,000
Developer Commitments	Local	Various	$22,390,388

Ongoing Programs

The final step in the HSM Roadway Safety Management Process is to conduct a Safety Effectiveness Evaluation. The City of Lincoln provided a list of 36 intersections where countermeasures had been identified and implemented since 2003. Improvements range from low cost (installations of signs) to high cost (total intersection reconstruction). The crash histories of each intersection were evaluated before and after the improvements were implemented. The before and after analysis consisted of the total number of crashes at the intersection, the EPDO crashes, project costs, benefits to date, projected benefits over the life of the project, and a projected benefit-to-cost. In summary:

- The City of Lincoln has spent **$25.2 million** on these 36 projects.
- To date, the City has been able to secure over **$11 million** in federal funding to support local safety projects.
- To date, the intersection improvements have resulted in societal cost savings of over **$79 million** in comprehensive crash costs.
- If the crash trends continue, the projected net benefits are estimated to be nearly **$243 million** over the service life of these projects.

A summary table of these projects and their associated benefits is illustrated in Table 7. Additional analysis results of the safety effectiveness evaluation for each intersection are contained in Appendix E.

Continued monitoring and documentation of intersections that undergo improvements to help mitigate deficiencies is a pro-active way for the City of Lincoln to illustrate a successful safety program. By spending study, design, and construction dollars to help eliminate life-changing crashes for the City of Lincoln residents, positive benefits will continue to justify expenditures.

Table 7 – Before/After Analysis of Selected Safety Improvements

	Intersection*	Year of Improvement	Service Life	Cost (2012)	Avg Annual EPDO Crashes Before	Avg Annual EPDO Crashes After	Proj. Benefits Project Life	Proj. B/C Project Life
1	27th St & "O" St	2004	20	$541,952	301.8	252.2	$9,569,300	18:1
2	70th St & "O" St	2003	20	$935,845	217.9	120.9	$18,730,500	20:1
3	N 27th St & Vine St	2005	15	$9,405	299.5	311.7	-$1,769,600	-188:1
4	S 9th St & Van Dorn St	2003	15	$4,991	93.3	30.8	$9,047,100	1813:1
5	S 17th St & "K" St	2005	20	$158,706	109.8	118.5	-$1,687,400	-11:1
6	S 10th St & "A" St	2003	15	$4,991	53.4	40.7	$1,838,600	368:1
7	25th St & "O" St	2004	20	$182,314	145.5	91.1	$10,495,800	58:1
8	S 27th St & Southridge Rd	2004	20	$243,085	8.0	19.0	-$2,133,400	-9:1
9	N 27th St & Old Dairy Rd	2006	20	$227,772	23.0	29.4	-$1,235,300	-5:1
10	N 17th St & Cornhusker Hwy	2006	20	$204,995	42.4	50.0	-$1,477,700	-7:1
11	S 52nd St & Lowell Ave	2004	6	$243	16.2	3.8	$718,300	2955:1
12	14th St & NE Hwy 2	2006	20	$683,315	194.9	88.7	$20,505,400	30:1
13	Rosa Parks Way & NE Hwy 77	2006	20	$14,805,169	140.1	36.5	$19,997,200	1:1
14	48th St & "O" St	2006	20	$2,562,433	512.5	208.2	$58,758,400	23:1
15	N 9th St & "P" St	2004	15	$2,674	33.8	30.4	$493,500	185:1
16	N 10th St & "P" St	2004	15	$2,674	89.1	37.7	$7,448,300	2786:1
17	N 9th St & "Q" St	2004	15	$2,674	131.4	61.8	$10,071,400	3767:1
18	N 10th St & "Q" St	2004	15	$2,674	81.9	72.9	$1,300,200	486:1
19	S 14th St & Old Cheney Rd	2006	20	$130,969	63.7	56.7	$1,354,500	10:1
20	S 27th St & Van Dorn St	2007	15	$2,436	115.1	42.4	$10,526,800	4321:1
21	N 48th St ("O" St to "R" St)	2006	20	$1,708,289	37.7	51.9	-$2,747,500	-2:1
22	S 70th St & Stacy Ln	2006	20	$227,772	51.6	28.6	$4,432,500	19:1
23	S 27th St & Porter Ridge Rd	2008	20	$109,837	33.8	1.0	$6,327,100	58:1
24	S 70th St & Teton Dr	2007	15	$2,436	68.5	46.0	$3,265,500	1340:1
25	N 19th St & "Q" St	2005	6	$235	32.5	16.1	$953,000	4053:1
26	N 66th St & Fremont St	2005	6	$235	67.1	26.5	$2,351,600	10002:1
27	N 26th St & Orchard St	2005	6	$235	16.6	3.9	$736,600	3133:1
28	S 23rd St & "E" St	2005	6	$235	16.6	22.8	-$362,000	-1540:1
29	N 56th St & Cornhusker Hwy	2007	20	$1,051,954	102.4	24.0	$15,148,300	14:1
30	N 84th St & Havelock Ave	2007	20	$166,098	10.4	35.4	-$4,829,200	-29:1
31	N 27th St & Whitehead Dr	2007	20	$243,610	38.9	17.2	$4,197,600	17:1
32	S 56th St & Elkcrest Dr	2008	20	$767,791	92.7	59.5	$6,397,900	8:1
33	S 40th St & Yankee Hill Rd	2007	20	$164,991	69.4	11.7	$11,145,300	68:1
34	S 27th St & Hwy 2	2004	20	$1,142,501	302.5	199.3	$19,918,900	17:1
35	S 27th St & A St	2010	20	$315,874	90.8	138.3	-$9,170,400	-29:1
36	Van Dorn St & Hwy 2	2007	20	$908,003	173.3	105.4	$13,122,300	14:1
	Total			**$25,153,035**			**$243,439,400**	**10:1**

7.0 ACKNOWLEDGEMENTS

Engineering Services / Public Works and Utilities

- Virendra Singh
- Shane Dostal
- Lonnie Burklund
- Tim Hunt
- Scott Opfer
- Randy Hoskins
- Erin Sokolik
- Larry Jochum
- Mark Weiting

Consultant Team

- Lonnie Burklund
- Bryan Guy
- Steve Garbe
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- Mike Malone
- David McClintock
- Wendy Lind